(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
27 June 2002 (27.06.2002)

PCT

(10) International Publication Number
WO 02/49490 A1

(51) International Patent Classification[7]: A47K 5/12

(21) International Application Number: PCT/US01/44905

(22) International Filing Date:
30 November 2001 (30.11.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

09/741,570	19 December 2000 (19.12.2000)	US
09/911,073	23 July 2001 (23.07.2001)	US
09/911,361	23 July 2001 (23.07.2001)	US
09/964,289	26 September 2001 (26.09.2001)	US
09/964,290	26 September 2001 (26.09.2001)	US
09/997,278	28 November 2001 (28.11.2001)	US

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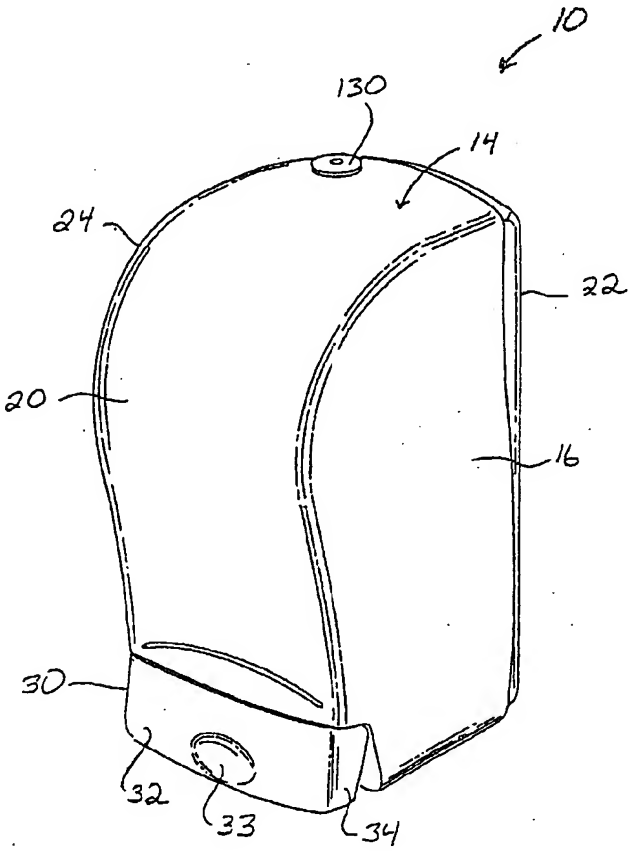
(54) Title: SELF-CONTAINED VISCOUS LIQUID DISPENSER



(57) Abstract: A viscous liquid dispenser includes a housing that defines an internal liquid reservoir. A dispensing pump mechanism is disposed at least partially within the reservoir and has a delivery end extending out of the reservoir. A mounting mechanism is configured as an integral component of the housing and provides the dispenser with the ability to be detachable connected to complimentary mounting structure on a wall surface. A unique dispensing pump mechanism is also provided for use with any manner of viscous liquid dispenser.

WO 02/49490 A1

(81) **Designated States** *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) **Designated States** *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

TITLE OF THE INVENTION

SELF-CONTAINED VISCOUS LIQUID DISPENSER

RELATED APPLICATIONS

The present PCT application claims priority to U.S. Application Serial No. 09/741,570 filed on December 19, 2000; U.S. Application Serial No. 09/911,073 filed on July 23, 2001; U.S. Application Serial No. 09/911,361 filed on July 23, 2001; U.S. Application 09/964,289 filed on September 26, 2001; U.S. Application Serial No. 09/964,290 filed on September 26, 2001; and U.S. Application Serial No. *not yet assigned* filed on November 28, 2001.

FIELD OF THE INVENTION

The present invention relates to the field of viscous liquid dispensers, for example soap dispensers, shampoo and lotion dispensers, food product dispensers, and the like.

BACKGROUND OF THE INVENTION

Various configurations and models of liquid dispensers, particularly liquid soap dispensers, are well known in the art. Conventional dispensers typically employed in public restrooms and the like are wall mounted units that typically include a house or structure that is permanently affixed to a wall. These dispensers typically include an access door or member so that the dispenser can be opened by a maintenance person for refilling or servicing. With certain types of dispensers, separate refill cartridges are inserted into the housing structure. With other types of dispensers, the maintenance technician must directly refill a reservoir provided in the housing structure. The dispensers typically include a delivery device, such as a dosing pump, and a device such as a lever or button for actuating the dosing pump. The dispensers may be vented or unvented.

The conventional dispensers depend on the continued maintenance and operability of the housing structure that is permanently affixed to the wall. In other words, if the housing

structure, and particularly the dosing pump, is damaged or vandalized, the dispenser becomes inoperable and must be replaced. The conventional dispensers also depend on a supply system wherein additional liquid soap must be separately stored, transported, and loaded into the dispensers. This process entails unnecessary logistic and man power resources.

The present invention is an improvement over existing systems in that it provides a disposable self-contained dispenser with a significantly increased capacity as compared to standard dispensers, is relatively inexpensive, and does not depend on the separate storage and delivery of refill cartridges or bulk volumes of liquid soap or other type of viscous product.

OBJECTS AND SUMMARY OF THE INVENTION

Objects and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned through practice of the invention.

The present invention provides a self-contained viscous liquid dispenser. Although having particular usefulness as a liquid soap dispenser, the dispenser according to the invention is not limited to a liquid soap dispenser and may be utilized in any application wherein it is desired to dispense metered doses of a viscous liquid. For example, the dispenser may have particular usefulness as a shampoo dispenser, lotion dispenser, food product dispenser (i.e., catsup, mustard, or mayonnaise dispenser), or any other product dispenser for dispensing metered amounts of a viscous substance. The liquid dispenser will be described herein with reference to a soap dispenser for ease of explanation.

The viscous liquid dispenser includes a housing that may be formed of any suitable material. For example, the housing may be molded from relatively inexpensive plastic materials and may have any d sired aesthetic shape. The housing also defines an integral sealed internal liquid reservoir. In other words, the liquid reservoir is not a

separate component from the housing, such as a cartridge or the like. The housing may be comprised of wall members that give the dispenser its outward appearance and also define the internal liquid reservoir.

A dispensing pump mechanism is disposed at least partially within the reservoir. The pump mechanism has a delivery end that extends out of the reservoir which is actuated by a user to dispense the viscous liquid.

The dispenser also includes a mounting mechanism that is configured as an integral component of the housing. The mounting mechanism allows the dispenser to be detachably connected to complimentary mounting structure on a wall surface. In this way, the dispenser may be easily removed from the wall surface for disposal or recycling once the liquid has been depleted. A new liquid dispenser according to the invention is then attached to the wall surface.

In one embodiment of the invention, the housing comprises a substantially vertical back side that is configured to be placed adjacent to the wall surface. The mounting mechanism is configured in the back side. For example, if the housing is a molded component, the mounting mechanism is molded integral with the back side. The mounting mechanism may comprise a recess that is defined in the back side. The recess may be defined by side walls that have engaging structures defined thereon. These engaging structures interlockingly engage with complimentary structure provided on the wall mounting structure. The wall mounting structure may be, for example, a plate member or similar device that is relatively permanently affixed to the wall. In one embodiment of the engaging structure, the vertical side walls of the recess include at least one angled surface on each vertical side wall. These angled surfaces engage against complimentary angled surfaces on the mounting wall structure similar to a conventional dove-tail configuration. The housing is slidable in a g nerally vertical direction onto the wall mounting structure so that the

angl d surfaces of the mounting mechanism slide into engagement against the angled surfaces of the wall mounting structure. Once engaged, the angled surfaces prevent the dispenser from being pulled away from the wall mounting structure. A securing device may be provided on the back side of the housing to prevent relative sliding movement between the housing and the wall mounting structure upon engagement of the angled surfaces. This securing device may be, for example, a simple protrusion disposed on the back side of the housing that engages in a complimentary recess or divot defined in the wall mounting structure. In an alternate embodiment, the protrusion or a locking nub may be provided on the wall mounting structure to engage in a complimentary recess or divot formed in the housing recess.

In one particular embodiment of the invention, the wall mounting structure is made of a relatively hard, rigid material (i.e., a metal or hard plastic bracket) and may have at least one dimension (i.e., width or depth) that is greater than the corresponding dimension of the housing recess. The housing may be formed of a material, such as plastic, having an inherent degree of "play" or resiliency. In this manner, upon mounting the housing onto the wall mounting structure, the greater dimension component of the mounting structure will cause the corresponding portion of the housing recess to "bow" or flex so as to accommodate the over-sized wall mounting structure. This configuration provides for an extremely secure and tight engagement between the housing and wall mounting structure that prevents the housing from wobbling or otherwise moving relative to the supporting wall. To a user, the housing will appear to be permanently bolted or otherwise mounted to the wall and there will be essentially no indication that the housing can be removed. Also, the housing cannot be pulled away or pried from the wall mounting structure without extreme force.

In one particularly useful embodiment, at least two spaced apart angled surfaces are provided on each vertical wall of the recess that

engage against complim ntary spaced apart angled surfaces on the wall structure. The spaced apart configuration of the angled surfaces maximizes the surface contact area between the housing and the wall mounting structure without significantly increasing the relative sliding distance between the members.

As mentioned, the housing structure is preferably formed from a relatively inexpensive molded plastic and may comprise separately molded components that are permanently affixed or adhered to each other. For example, the housing may include a front component that is formed separately from and adhered to a back component. It may be desired that the front and back components have different characteristics. For example, it may be desired that the back component is more rigid than the front component to provide enhanced structural support and rigidity to the dispenser mounted on the wall structure.. This may be accomplished by simply making the back component thicker than the front component. The front and back components may be molded or otherwise formed from different types of materials.

It may also be desired to make at least a portion of the housing translucent or clear so that a maintenance technician can easily determine the remaining level of liquid within the reservoir. For example, a window may be provided in the housing. In one particularly useful embodiment, the housing includes a back component that is formed from a translucent material so that the entire volume of the reservoir is visible from the outside.

Any manner of actuator may be provided with the dispenser to allow the user to operate the pump mechanism. For example, in one embodiment, the actuator may comprise a panel member that contributes to the aesthetic appearance of the housing. The panel member may be hinged or oth rwise movably connected to the housing member and lie in contact against a delivery end of th pumping mechanism. Upon the user depressing or moving the panel,

the pumping mechanism is actuated so that a metered dose of the liquid is disp ns d. In an alternate embodiment, the actuator may comprise a member, such as a decorative cap or the like, directly attached to the delivery end of the pump mechanism. In other words, the actuator need not be connected directly to the housing. Various embodiments of aesthetically pleasing actuators may be used in this regard.

The pump mechanism may include a pump chamber that is formed integral with the housing within the reservoir. For example, the housing may comprise a molded plastic component wherein a pump chamber is integrally molded on the interior of the housing. The pump chamber has a back end that is open to the reservoir section of the housing and a front end that is open to the outside of the housing. A pump cylinder is slidably disposed and retained in the chamber. The pump cylinder has a channel defined therethrough and a delivery end extending out of the front end of the chamber. The pump cylinder is retained within the chamber so that it cannot be pulled therefrom. An actuator is configured with the delivery end of the pump cylinder so that the device may be actuated by a user from outside of the housing. A valve mechanism is disposed in the delivery end of the pump cylinder and is configured to close upon the user releasing the actuator to prevent leakage or dripping of liquid from the pump cylinder.

In one embodiment, the pump cylinder is insertable into the pump chamber from its back end. The chamber includes retaining structure, such as a flange member or the like, at its front end to prevent withdrawal of the pump cylinder from the pump chamber through the front end. A cap member or like device is attached to the back end of the pump chamber once the cylinder has been inserted into the chamber. The cap member has an orifice defined therethrough for drawing liquid into the pump chamber. A check valv device, such as a shuttle valv , is disposed in the orifice to clos the orifice upon actuation of the pump cylinder.

The valve mechanism disposed in the delivery end of the pump cylinder may comprise a flexible flap member that is movable to an open position by the pressure of the liquid being dispensed. Upon release of the actuator, the flap member automatically returns to a closed position and thus prevents undesired leakage or dripage of the liquid out of the delivery end of the pump cylinder. In one particularly useful embodiment, the valve mechanism comprises a plurality of flap members that define an opening therethrough in their open position, and seal against each other in their closed position.

The dispenser may also utilize a removable pump mechanism that is screwed or otherwise mated with the housing reservoir. For example, the pump mechanism may include a self-contained pump having a pump chamber housing, cap, or other suitable structure that is fitted to a bore defined through a housing wall so as to be in communication with the internal reservoir. Any type of conventional pump mechanism may be utilized in this regard. In this embodiment, the pump may be removed from the housing for subsequent re-use before disposing of the housing.

A vent path is defined into the reservoir to prevent drawing a vacuum therein. In a particularly desired embodiment, the vent is provided in a top surface of the housing structure. Since the housing structure is mounted in use upon a wall surface, there is little concern of the liquid leaking from the vent in the top surface. In other embodiments, the reservoir may be vented through the pump mechanism. However, venting through the pump mechanism may result in undesired leakage through the mechanism, particularly if the pump mechanism is disposed in the lower portion of the housing. Venting may also be accomplished through the valve mechanism in the delivery end of the pump cylinder.

Various embodiments of a top-mounted vent are contemplated for the dispenser. For example, a suitable vent mechanism mounted in the top wall of the housing may include a body member that slides into

a fill port defined in the top of the housing after the reservoir has been filled with a viscous liquid or substance through the port. The vent body interlockingly and sealingly engages with the top wall of the housing in such a manner that, once inserted, the vent body cannot readily be removed without causing significant damage to the dispenser. The vent may include a spring mounted or other resiliently mounted plug, such as a ball, within the vent passage. This plug essentially seals the vent until a user actuates the pump mechanism resulting in a partial vacuum being drawn in the reservoir upon a dose of the viscous liquid being expelled from the dispenser. This vacuum causes the plug to be drawn downwards against the force of the spring or other resilient member to unseal the vent orifice until pressure equalized across the vent, whereupon the plug reseats.

A unique advantage of a dispenser according to the present invention is that the capacity of such a dispenser may be significantly increased without necessarily increasing the dispenser "packaging." The term "packaging" is understood to be the materials and structure required to render and maintain a given capacity (volume) dispensing "position." For example, with conventional cartridge refill dispensers (i.e., a flexible bag cartridge refill placed in a wall mounted housing), the "packaging" for initial set up or replacement of the dispenser includes the cartridge materials and wall mounted housing structure into which the cartridge must be subsequently placed. For conventional dispensers wherein a reservoir in the housing is refilled directly with the liquid product from a bulk storage source, the "packaging" includes the entire wall mounted housing structure as well as the bulk storage container. With the present invention, the "packaging" is essentially the disposable housing structure and integral pump mechanism. The ratio of weight of packaging (grams) to capacity (volume in liters) can be significantly decreased with the present dispenser as compared to conventional devices. This leads to increased economic benefits with respect to shipping, handling,

storage, maintenance, etc.

It should be appreciated that the configuration and appearance of the housing is not a limiting feature of the invention. Also, the invention is not limited to the use of any particular type of materials or manufacturing process. Various embodiments of interlocking engagement structure between the back side of the housing and the wall mounting member are also within the scope and spirit of the invention. For example, the engaging structure may include bayonet type fasteners, or the like.

In an alternate embodiment of a pump mechanism that may be used in a dispenser according to the invention, an insert member is inserted through an opening defined in a front surface of the housing. The insert member extends into the reservoir and defines an internal pump chamber having a back end open to the reservoir and a front end open to the outside of the housing. The insert member is attached to the housing at the opening by any suitable mechanism. In one particular embodiment, the housing comprises a plurality of protrusions extending from the front surface and disposed around the opening. The insert member comprises a front flange having a plurality of counter-bored holes defined therethrough into which the protrusions extend upon mounting the insert member into the housing. The protrusions are then heated to a molten state wherein the protrusion material flows into the counter-bored holes and permanently affixes the insert member to the housing upon re-solidifying. If it is desired to recycle or reuse the pump mechanism, a less permanent or temporary type of attachment mechanism may be used to affix the insert member to the housing, such as a releasable adhesive, mechanical connection (i.e., threaded engagement), etc.

At least one seal disposed between an outer surface of the insert member and the housing to ensure that liquid within the reservoir does not leak out from around the insert member. In one

particular embodiment, this seal is a radially inward extending seal disposed around the opening in the housing that engages and seals against an outer surface of the insert member. This seal may be provided on a cylindrical extension of the housing that extends from the front surface into the reservoir. In an alternate embodiment, the seal may be a radially outward extending seal disposed at a forward end of the insert member that engages and seals against a portion of the housing defining the opening. It may be desired to use both types of seals in the same embodiment.

An alternative embodiment of a pump cylinder that may be used with an integrally formed pump chamber or pump chamber insert is also provided. This pump cylinder may include multiple components. For example, in one embodiment, the pump cylinder includes a first component and a second component inserted into a chamber defined in the first component. Longitudinally extending channels in the components align to defined a delivery channel through the pump cylinder. This channel terminates at a delivery orifice defined in a delivery end of the pump cylinder. Once combined, the components define a complete pump cylinder that is slidable within the pump chamber from a rest position to a pressurizing position wherein liquid drawn into the pump chamber is pressurized and dispensed through the delivery channel and out the dispensing orifice.

In order to seal the pump cylinder relative to the pump chamber, a first radially extending seal, such as a flange seal, may be provided on the first component of the pump cylinder that slidably engages along a wall defining the pump chamber. A second similar seal may be provided on the second component that also slidably engages along the pump chamber wall.

The invention will be described in greater detail below with reference to particular embodiments illustrated in the figures.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a dispenser according to the

present invention;

Figure 2 is a perspective view of the back side of the dispenser illustrated in Fig. 1;

Figure 3 is an alternative perspective view of the dispenser according to Fig. 1 and complimentary wall mounting structure;

Figure 4 is a cross-sectional view of the dispenser taken along the lines indicated in Fig. 3;

Figure 5 is a cross-sectional view of the pump mechanism of the dispenser taken along the lines indicated in Fig. 3;

Figure 6 is a cross-sectional operational view of the pump mechanism;

Figure 7 is a cross-sectional operational view of the pump mechanism;

Figure 8a is partial perspective and cut-away view of the pump mechanism particularly illustrating the check valve device;

Figure 8b is a partial perspective and cut-away view of the pump mechanism particularly illustrating the locking feature thereof;

Figure 9a is a perspective view of a valve mechanism incorporated in the pump cylinder;

Figure 9b is an operational perspective view of the valve mechanism of Fig. 9a;

Figure 10 is a perspective view of a back component of the dispenser housing;

Figure 11 is a perspective partial operational view of a wall mounting bracket for mounting the dispenser;

Figure 12 is a cross-sectional view of the wall mounting bracket taken along the lines indicated in Fig. 11;

Figure 13 is a cross-sectional view of the vent valve taken along the lines indicated in Fig. 2;

Figure 14 is a an enlarged perspective view of the panel member actuator attached to the pump housing;

Figure 15 is a perspective view of an alternative embodiment of

the dispenser;

Figure 16 is an nlarged component view of the actuator used with the dispenser illustrated in Fig. 15;

Figure 17 is a perspective view of an alternative embodiment of the dispenser particularly illustrating a window feature for determining the level of liquid within the dispenser;

Figure 18 is a perspective and partial cross-sectional view of an alternative embodiment of a vent mechanism is accordance with the invention;

Figure 19 is a perspective view of the lower portion of the body member for the vent mechanism of Figure 18;

Figure 20A is a cross-sectional view of the vent mechanism of Figure 18 particularly showing insertion of the vent mechanism into an opening in the housing upper wall;

Figure 20B is a cross-sectional view of the vent mechanism of Figure 20a after insertion into the housing and particularly illustrates an embodiment of a resilient locking mechanism for locking the vent mechanism to the housing wall;

Figure 21 is an enlarged cross-sectional view of the designated portion of Figure 20B for a countersunk bore in the housing wall;

Figure 22 is an enlarged cross-sectional view of the designated portion of Figure 20B for a straight bore in the housing wall;

Figure 23 is a cross-sectional view of an alternative embodiment of a vent mechanism according to the invention;

Figure 24 is a cross-sectional view of an alternative embodiment of a vent mechanism according to the invention;

Figure 25 is a cross-sectional view of an alternate embodiment of a pump mechanism according to the invention;

Figure 26 is a perspective partial component view of the pump mechanism embodiment of Figure 25;

Figure 27 is perspective partial assembled view of the components shown in Figure 26;

Figure 28 is a perspective view of th pump chamber insert of the mbodiment of Figure 25; and

Figure 29 is a perspective view of a component of the pump cylinder of the embodiment of Figure 25.

DETAILED DESCRIPTION

Reference will now be made in detail to embodiments of the invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, not meant as a limitation of the invention. For example, features illustrated or described as part of one embodiment, may be used with another embodiment, to yield still a further embodiment. It is intended that the present invention include modifications and variations to the embodiments described herein.

A viscous liquid dispenser 10 according to the invention is illustrated generally in the figures. The dispenser 10 is illustrated and described herein as a liquid soap dispenser, which is a particularly useful embodiment of the present invention. However, it should be appreciated that the present invention is not limited to a dispenser for liquid soap, but has application in any environment wherein it is desired to dispense a metered amount of a viscous liquid from a dispensing unit.

The dispenser 10 includes a housing, generally 14. The housing 14 may contain side walls or members 16, a back side 18, and a front side 20. The housing 14 can take on any desired configuration and be formed from any number of components. In the illustrated embodiment, the housing 14 includes a front component 24 and a back component 22. The front and back components are separately manufactured and are permanently joined. It should be appreciated that the components may be manufactured from any desired material. In a preferred embodiment, the dispenser 10 is a disposable item and the housing 14 is molded from a relatively inexpensive plastic material. Referring particularly to Fig. 10, the back component 22 may be

molded from a clear or translucent plastic and includes side edges 26 and alignment tabs 48. The tabs 48 align the back component 22 relative to the front component 24 and the side edges 26 fit into correspondingly sized recesses 28 (Fig. 4) defined in the side walls 16 of the front component 24. The back component 22 is permanently joined to the front component 24 by adhesives, welding, or any other relatively permanent attaching means.

The housing 14 defines an internal liquid reservoir 68 within the internal volume thereof. In the illustrated embodiment, the liquid reservoir 68 includes essentially the entire volume defined by the front component 24 and back component 22. Although not illustrated, it should be understood that any number of internal structural members, such as baffles or the like, may be included within the reservoir 68. It should be understood that the housing 14 thus also serves as a closed or sealed reservoir and the dispenser 10 cannot be opened by the maintenance technician. A desired amount of viscous liquid, for example soap, is pre-loaded into the dispenser 10 prior to the dispenser being delivered to its point of use.

Applicants have found that it may be desired for the back component 22 of the housing 24 to be more rigid than the front component 24. One way of achieving this feature is to simply mold the back component 22 with a thickness greater than that of the front component 24. As will be explained in greater detail below, the dispenser 10 is mounted onto a supporting wall surface by means of an internal mounting mechanism configured on the back side 18 of the housing 14. A more rigid back component 22 aids in mounting the dispenser 10. It has also been found that, if the front and back components are molded from a resilient plastic material, once the dispenser is empty, the back component 22 has enough "give" to enable the dispenser 10 to be easily removed from the supporting wall structure.

A dispensing pump mechanism, generally 88, is disposed at

least partially within the reservoir 68. The pump mechanism 88 has a delivery end 90 that extends out of the housing or reservoir 68. The pump mechanism 88 is configured to dispense a metered amount of the viscous fluid upon a user actuating the pump mechanism. It should be appreciated that any number of conventional and well known pump devices may be utilized in the dispenser 10. The pump mechanism 88 illustrated in the drawings is one embodiment of a particularly well suited mechanism.

It is also within the scope of the invention to configure a removable pump mechanism with housing 24. For example, any manner of conventional pump may be screwed or otherwise mated with the housing 24 so as to be in communication with the reservoir 68. For example, such a pump mechanism may include a self-contained pump having a pump chamber housing, cap, or other suitable structure that is fitted to a bore defined through a front wall of the housing 24 so as to be in communication with the internal reservoir 68. Installation of the pump could take place at the point of use of the dispenser. For example, the pump from a spent dispenser may be removed from the housing and immediately installed into a replacement housing. A removable plug or breakable seal could be used to cover the housing port through which the pump is inserted until.

Referring to an embodiment of the pump mechanism shown in Figs. 5 through 7, the pump mechanism 88 includes a cylinder 92 that is slidable within a chamber 70. The volume of chamber 70 determines the metered dose of liquid dispensed upon each actuation of the pump. The chamber 70 may be formed by any internal structure of the housing 14. It may be preferred that the chamber is defined by structure integrally molded with the front component 24 of the housing 14. In the illustrated embodiment, the chamber 70 is defined by chamber walls 72 as a generally cylindrical chamber. The cylinder 92 includes a channel 94 defined longitudinally therethrough. The channel 94 is in communication with the interior of the pump chamber

70 through an end wall of the cylinder. The deliv ry channel 94 terminates at a dispensing orifice 96 defined in the front end of the cylinder 92.

The cylinder 92 sealingly engages against the chamber walls 72 by any conventional means. For example, a flange or piston 101 may be disposed at the rear end of the cylinder 92 for sealing engagement against chamber wall 72. In an alternative embodiment, O-rings 116 (Fig. 8a) may be provided around the piston 101. The piston 101 pressurizes the chamber 70 and ensures that the viscous liquid contained within the chamber is dispensed through the delivery channel 94 upon actuation of the cylinder 92 and does not simply move from one end of the pump chamber 70 to the other upon movement of the cylinder.

The pump cylinder 92 is biased within the chamber 70 by way of, for example, a spring 98. Other resilient devices, including a leaf spring, spring washer, and the like, may be utilized for this purpose. In the illustrated embodiment, the spring 92 is seated within a recess 102 defined by a flared flange 100, as particularly illustrated in Figs. 5 through 7. The opposite end of the spring 98 is fitted around a cylindrical extension 76 of an end cap 74. The end cap 74 is permanently fixed to the structure defining the pump chamber 70 after the cylinder 92 has been inserted into the pump chamber.

Structure is also provided to ensure that the cylinder 92 cannot be pulled from the front end of the chamber 70. In the illustrated embodiment, this structure corresponds to a flange portion of the front wall 86 of the chamber 70. As illustrated in Fig. 5, the flange portion 86 of the wall engages against the piston 101 of the pump cylinder 92.

A check valve device 104 is configured with the pump mechanism 88 to ensure that the viscous liquid within the pump chamber 70 is not pushed out of the chamber 70 upon movement of the cylinder 92 within the chamber 70. In the illustrated embodiment, the check valve device 104 is a shuttle type check valve having radially

extending arms 106. The shuttle valve is slidably disposed within an opening defined through the end cap 74. The spac between the radial arms 106 is open to the reservoir 68 so that the liquid can flow from the reservoir 68 into the pump chamber 70 upon movement of the cylinder to the forward end of the pump chamber 70, as illustrated in Fig. 7. A cap 108 is provided on the forward end of the shuttle valve 104 disposed within the pump chamber 70 to ensure that the opening in the end cap 74 is sealed upon actuation of the pump. The cap 108 seals against the end face of the end cap 74.

Operation of the pump mechanism 88 is particularly illustrated in Figs. 6 and 7. To dispense a metered amount of the viscous liquid contained within the reservoir 68, a user actuates the pump mechanism 88 by way of an actuator 30. The actuator 30 will be described in greater detail below. Upon depressing the actuator 30, the pump cylinder 92 is moved rearward within the pump chamber 70. Pressure of the viscous liquid within the chamber 70 forces the shuttle valve 104 to close and the viscous liquid contained within the chamber 70 is directed into the delivery channel 94 defined longitudinally within the pump cylinder 92. The viscous liquid is expelled through the dispensing orifice 96, as particularly illustrated in Fig. 6. Upon release of the actuator 30, the spring 98 forces the pump cylinder to return to the position illustrated in Fig. 7. This action unseats the shuttle valve 104 and draws viscous liquid back into the pump chamber 70, as particularly illustrated in Fig. 7.

So as not to draw a vacuum within the reservoir 68, the reservoir is vented. This venting may be accomplished by various means. For example, the reservoir 68 could be vented directly through or around the cylinder 92. However, this may not be a desired embodiment since fluid would tend to leak out from around the cylinder. One preferred venting method as illustrated in the figures is to vent the top of the housing 14, for example by way of a conventional vent valve 130 disposed through the top surface of the housing 14. The vent valve

130 is particularly illustrated in Fig. 13 and utilizes a ball 132 seated within a ball cage 134. The ball 132 seats against and seals an opening provided in a top member 133 upon an overfill condition of the viscous liquid, as illustrated in Fig. 13, or upon the housing 14 being overturned during shipment or the like. Once the dispenser is hung on a wall surface for subsequent use, the ball 132 falls within the ball cage 134 to open the vent valve 130. Sealing of the ball 132 may further be assisted by a spring.

As mentioned, the pump mechanism 88 is operated by a user depressing an actuator 30. The actuator 30 may be any member configured to move the pump cylinder 92. In one embodiment illustrated in the figures, the actuator 30 is defined by a panel member 32 that adds a distinctive aesthetically pleasing look to the housing 14. The panel member 32 includes side walls 34 having inwardly disposed protrusions 36 (Fig. 14) that engage within correspondingly sized divots or recesses 38 provided in the sides 16 of the housing 14. A channel member 40 (Fig. 3) may be provided on the inner face of panel member 32 to positively engage against the front end of the pump cylinder 92. A depression 33 may be defined in the front face of panel member 32 to indicate to a user the proper location for depressing the actuator.

It should be appreciated that the actuator may take on any configuration or aesthetically pleasing shape. In an alternate embodiment illustrated particularly in Figs. 15 and 16, the actuator 30 is defined by a cap 42 that is attached directly to the front face 93 of the pump cylinder 92. This attachment may be provided by adhesives, mechanical interlocking devices, or the like. Arms 44 may slidably engage within recesses 46 defined in the pump housing 14 to ensure proper alignment and to provide rigidity to the structure.

Figs. 8a and 8b illustrate a locking characteristic of the pump cylinder 92 that is particularly useful during shipment of the dispensers 10. The pump cylinder 92 may include a longitudinal channel 118

defined in the top thereof.

A tab portion 87 of the pump chamber front wall member 86 is disposed within the longitudinal channel 118. In this way, the pump cylinder 92 is prevented from rotating upon actuation and release thereof. A partial circumferential channel 120 is defined in the pump cylinder 92, as particularly illustrated in Fig. 8a. The circumferential channel 120 is defined along the pump cylinder 92 at a location corresponding to the completely depressed or actuated position of the cylinder 92 within the chamber 70, as illustrated in Fig. 6. For shipment of the dispensers 10, the pump cylinder 92 may be depressed and then rotated so that the tab 87 is engaged within the circumferential channel 120, as particularly illustrated in Fig. 8b. In this configuration, the pump cylinder 92 is locked in position and cannot move within the chamber 70 until the pump cylinder is rotated back into the position illustrated in Fig. 8a. This procedure would be accomplished by the maintenance technician prior to attaching the actuator 30 and mounting the dispenser 10 onto a supporting wall surface.

It may be desired to include a valve mechanism within the dispensing orifice 96 of the pump cylinder 92 to prevent leakage of viscous liquid or soap from the dispenser. Any manner of sealing valve may be utilized in this regard. Applicants have found that a particularly useful valve mechanism 110 is the type of valve illustrated in Figs. 9a and 9b. This valve 110 includes a flange member 113 used to seat the valve 110 within the delivery and of the pump cylinder 92, as particularly illustrated in Figs. 5 through 7. The valve includes at least one, and preferably a plurality, of resilient flaps 112 defining an opening 114 therethrough. The flaps 112 seal against themselves when the valve 110 is positioned within the pump cylinder 92 in the orientation illustrated in Figs. 5 through 7. Upon actuation of the pump cylinder 92, liquid pressure forces the resilient flaps 112 to open to dispense the liquid from the pump cylinder 92, as particularly illustrated

in Fig. 6. A separate cap member 122 may be used to secure the valve 110 in position with respect to the dispensing orifice 96, the cap member 122 includes its own opening aligned with the dispensing orifice. The cap member 122 may comprise a press fit element or may be permanently adhered, welded, etc., to the pump cylinder 92.

The valve 110 also tends to vent the pump chamber 70 as the cylinder 92 moves back to its rest position after being actuated. As a vacuum is drawn in the chamber 70, the resilient flaps separate slightly and are drawn towards the chamber 70 thus defining a vent path. Once the chamber is vented, the flaps close and seal against each other.

The valve 110 illustrated in Figs. 9a and 9b is conventionally known in the art as a bifurcating valve and may be obtained from LMS Corporation of Michigan.

The dispenser 10 according to the invention also includes an integrally formed mounting mechanism configured as an integral component of the housing 14. This mounting mechanism allows the dispenser 10 to be detachably connected with complimentary mounting structure, generally 58, provided on a wall surface 12 (Fig. 3). In one embodiment according to the invention, the mounting mechanism is defined as an integrally molded feature of the back side 18 of the dispenser 10. This feature is not limited to any particular type of structure, and includes any suitable type of connector or engagement structure for detachably mounting the housing to complimentary mounting structure provided on a wall surface 12. It is desirable that the mounting mechanism structure be encircled by a "border" of the back side 18 of the housing, as seen for example in Fig. 3, so that upon mounting the housing 14 against a wall surface 12, the border section of the back side 18 is directly against the wall surface 12. With this configuration, the mounting mechanism is not visible from any angle and there is essentially no space between the housing 14 and the wall surface 12 through which a potential vandal would be tempted

to insert a prying device.

In the illustrated embodiment, the integral mounting mechanism feature includes a recess 50 is molded into the back side 18. The recess 50 is defined by generally vertical side walls 52. Engaging structure is provided along the side walls 52 for engaging against or with complimentary structure provided on the wall mounting structure 58, as discussed in greater detail below. In the illustrated embodiment, the engaging structure is defined by angled surfaces 56 defined along the vertical walls 52. The angled surfaces 56 engage against complimentary angled surfaces 62 defined on the wall mounting structure 58, as can be particularly seen in Figs. 3 and 12. In the illustrated embodiment, at least two angled surfaces 56 are provided and are separated by a section of vertical wall 52. The two angled surfaces 56 engage against angled surfaces 62 of the wall mounting structure 58. In order to attach the dispenser 10 to the wall mounting structure 58, the maintenance technician simply positions the dispenser 10 against the wall mounting structure 58 such that the angled surfaces 56 are vertically disposed between the corresponding angled surfaces 62 of the wall mounting structure. Then, the maintenance technician simply slides the dispenser 10 in a vertical direction so that the angled surfaces 56, 62 engage, as particularly illustrated in Fig. 12. In this interlocking configuration, the dispenser cannot be pulled away from the wall mounting structure 58. The double angled surface 56 configuration provided on each vertical wall 52 is particularly useful in that it provides an increased interlocking surface area of angled surfaces with relatively little vertical movement required between the dispenser 10 and the wall mounting structure 58 as compared to a single angled surface 56 having the same longitudinal surface area.

In one particular embodiment of the invention, the back wall 18 of the housing may be formed of a material, such as plastic, having an inherent degree of "play" or resiliency. The wall mounting structure 58

on the other hand may be made of a relatively hard, rigid mat rial (i.e., a metal or hard plastic bracket) and may have at least on dimension (i.e., width or depth) that is greater than the corresponding dimension of the housing recess 50. For example, the width of the mounting structure 58 at the angled surfaces 62 may be slightly greater than the corresponding mating width portion of the recess 50 defining the angled surfaces 56. In this manner, upon mounting the housing onto the wall mounting structure, the greater dimension component of the mounting structure will cause the corresponding portion of the housing recess to "bow" or flex so as to accommodate the over-sized wall mounting structure. This configuration provides several advantages. An extremely secure and tight engagement between the housing and wall mounting structure is provided that prevents the housing from wobbling or otherwise moving relative to the supporting wall. To a user, the housing will appear to be permanently bolted or otherwise mounted to the wall and there will be no indication that the housing can be removed. As mentioned above, the recess desirably may be completely encircled within a border portion of the back wall so that it is not visible from any angle upon mounting the housing onto the supporting wall. The housing back wall would appear to be directly flush against the supporting wall with a minimum uniform separation being defined completely around the back wall. Also, the housing cannot be pulled away or pried from the wall mounting structure without extreme force.

Once the dispenser 10 has been properly located on the wall mounting structure 58, it is desirable to include a securing device to indicate to the technician that the dispenser 10 has been properly positioned and to prevent removal of the dispenser 10 without a concerted effort. In the embodiment illustrated, the securing device comprises a protrusion 126 extending from the back sid 18 of the housing within the recess 50. The protrusion 126 slides up a ramp surface 129 defined in the mounting structure 58 and snaps into a

correspondingly sized divot 128 disposed adjacent to the ramp surface 129. The wall mounting structure 58 may comprise any manner of suitable attaching structure. In the illustrated embodiment, the wall mounting structure 58 is defined by a plate member 64 that is attached to the wall surface 12, for example by screws, adhesives, or the like. The wall mounting structure 58 serves simply to provide an interlocking engagement device for the dispenser 10. It should be appreciated that any manner of interlocking engaging configurations may be provided for detachably connecting the dispenser 10 to complimentary wall structure provided on a supporting wall. For example, relatively simple bayonet type fasteners, spring loaded latches, and the like, may be provided in this regard. A desirable feature of the invention is that the entire dispenser 10 is disposable and, thus, relatively simple yet reliable engagement devices are preferred. It has been found that the double angled surface configuration as illustrated and described herein is particularly useful in this regard.

It may also be desired to provide means for the maintenance technician to determine the level of viscous liquid within the dispenser. In this regard, as discussed above, a portion of the housing 14 may be formed from a translucent or clear material. In the embodiment illustrated particularly in Fig. 1, the entire back component 22 is formed from a translucent or clear material so that the service or maintenance technician can view the remaining liquid level from the side of the dispenser. In an alternative embodiment illustrated in Fig. 19, a window 136 of clear or translucent material may be provide anywhere in the housing 14, preferably near the bottom portion of the housing, to provide the maintenance technician with the capability of viewing inside the reservoir to determine the remaining amount of liquid therein.

As mentioned, the unique structure and configuration of the housing with its internal reservoir and integrally formed wall mounting recess allows for a dispenser according to the present inv ntion with a capacity that may be significantly increased without necessarily

increasing the dispenser "packaging" (as defined above). For example, a 2.5 liter capacity dispenser in accordance with the invention is presently contemplated. It is anticipated that the dispenser packaging (housing and integrated pump mechanism) will weigh only about 250 grams. Thus, for maintaining and servicing a 2.5 liter dispensing "position," only about 250 grams of materials is necessary. On the other hand, if the same volume conventional cartridge or direct refill dispenser would need replacement due to vandalism, inoperative pump, etc., the combined weight for the housing and refill materials would be substantially greater. For the 2.5 liter capacity dispenser according to the invention, a weight (grams) to volume (liters) ratio is about 100:1. Applicants believe this to be a significant improvement over conventional refill dispensers (either cartridge refills or direct refill of a housing from a bulk storage container). For dispensers according to the invention with a greater capacity, for example a 5 liter dispenser, it is believed that the increase in packaging weight is not be a linear function and, thus, the weight to volume ratio will be reduced as capacity increases.

Thus, dispensers of various volume capacities can be designed according to the invention wherein the ratio of packaging weight in grams to volume capacity in liters is generally not greater than about 120:1, and is preferably about 100:1 or less. In one particularly useful embodiment of a 2.5 liter capacity dispenser, the ratio is about 100:1.

It should be appreciated that dispensers according to the invention are not limited in their size so long as the mounting mechanism between the housing and wall mounting structure is structurally sufficient to support the weight of the filled housing.

Figures 18 through 24 illustrate alternate embodiments of a vent mechanism that may be utilized in a dispenser according to the present invention. As with the vent 130 shown in Figure 13, these vents prevent a vacuum from being drawn in the reservoir 68 by equalizing pressure between the reservoir and the surrounding

environment. Referring to Figures 19 through 22, one particular vent mechanism 230 is configured to be disposed through an opening 238 in the upper wall 232 of the housing. This opening 238 may also serve as a fill port for initially filling the reservoir 68. The vent mechanism 230 includes a body, generally 250, that interlocking and sealingly engages with the wall 232. In the embodiment illustrated, the body 250 is inserted through the opening 238 and subsequently automatically engages against the inner surface 236 of the wall 232 so that the vent mechanism 230 cannot thereafter be pulled from the housing.

The vent body 250 in the shown embodiment includes an upper body portion 260 and a lower body portion 252. These portions may be separately molded or formed and subsequently joined, for example at a ledge 257 as particularly seen in Figure 18. The portions may be joined by any conventional means, including adhesives, ultrasonic welds, etc. The portions may also be formed as a single integral unit, for example as a single molded body component.

The lower body portion 252 is a generally cylindrical or truncated component defining a lower vent passage 258. At least one, and preferably a plurality, of resilient members, such as resilient tabs 254, are configured on the body to engage and secure the vent 230 to the housing wall 232. As particularly seen in Figures 20A and 20B, the resilient tabs 254 are angled away from a vertical axis through the lower body portion 252 so that they are able to flex inward upon insertion of the body 252 through the opening 238. Once the tabs 254 have cleared the inside surface 236 of the wall, they flex radially outward as shown in Figure 20B. The vent 230 thus cannot thereafter be pulled from the housing.

The lower body portion 252 includes substantially rigid tabs 256 interspaced between the resilient tabs 254 and oriented generally parallel to a vertical axis through the body portion. These tabs 256 define a cage-like structure for receipt of the upper body portion 260.

It should be appreciated that various structural configurations are possible to define the resilient member and lower body portion 252, and that the illustrated embodiment is not intended to limit the invention.

The upper body portion 260 is a generally cylindrical member defining an upper vent passage 262 terminating in a vent orifice 242. The upper vent passage 262 is aligned with the lower vent passage 258 upon assembly of the upper body portion 260 with the lower body portion 252.

A vent plug, generally 244, is movably disposed in the vent passage 262 to seal the vent orifice 242 in an at-rest or static condition of the vent mechanism. In the illustrated embodiment, the vent plug is a ball 246 biased against inclined surface 264 by a spring 272. Thus, as can be readily seen in the figures, in its static position, the ball 246 is pressed against the inclined surface 264 and the vent orifice 242 is blocked. The reservoir 68 is thus essentially sealed to the external environment.

The upper body portion 260 further includes a cap, generally 266. The vent orifice 242 is defined through the center of the cap 266. In the illustrated embodiment, the cap 266 is a plate-like member and includes a resilient circumferential lip 268. This lip 268 defines a first seal between the vent mechanism and the dispenser housing. In its unstressed or relaxed state shown in dashed lines in Figures 21 and 22, the resilient lip has a radius of curvature greater than that of the remaining portion of the cap 266. Upon insertion of the vent through the housing opening 238, the lip 268 is pressed against a surface of the housing upper wall 232 and is caused to flatten out and seal against the housing surface. To ensure that a constant compressive force is applied to the cap 266, the vertical distance "d" (Fig. 23) between the edge of the lip 268 and the top of the resilient tabs 254 is greater than the thickness of the housing wall 232. In this way, once the vent has been inserted through the housing wall, the resilient tabs

254 also exert a constant downward pulling forc on the cap 266 causing the resilient lip 268 to compress and seal against the housing surface.

The upper body portion 260 also includes a resilient skirt member 270 extending downwardly from an underside of the cap 266. A foot 271 is defined at the end of the skirt 270. The skirt and foot configuration define an independent second seal between the vent mechanism and the dispenser housing. Referring to Figures 21 and 22, the skirt foot 271 has a relaxed or unstressed diameter greater than that of the opening 238 through the housing wall 232, as indicated by the dashed lines in the figures. Upon insertion of the vent mechanism through the opening 238, the skirt is compressed radially inward and the foot 271 sealingly engages against the wall 239 of the opening.

In the embodiment illustrated in Figure 22, the opening 238 in the housing wall 232 is defined by a straight vertical wall 239. The foot 271 of the resilient skirt 270 seals against this wall 239 and the resilient lip 268 seals against the upper surface 234 of the housing wall. In this configuration, it is necessary that the skirt does not have a vertical length greater than the thickness of the housing wall 232.

In the embodiment of Figure 21, the opening 238 is defined as a counterbore hole having a second wall 240 radially offset from the wall 239. In this configuration, the resilient lip seals against the counterbore circumferential wall or ledge 241 and the cap 266 is more or less flush with the upper surface 234 of the housing wall depending on the depth of the wall 240. In this configuration, the lip 268 should not extend to the second wall 240 and the skirt 270 should not extend below the wall 239.

In the embodiment of Figures 18 and 20B, the opening 238 is also a counterbore hole. However, in this configuration, the skirt foot 271 engages against the second wall 240 and the resilient lip 268 engages against the top surface 234 of the housing wall. The vertical

length of the skirt 270 should not be greater than the depth of the second wall 240.

In a static or at-rest mode of the vent mechanism 230, the vent plug 244 (i.e., ball 246) is resiliently pressed into engagement against angled surface 264 defining the vent orifice 242. This engagement may be an essentially airtight seal. Upon a user actuating the pump mechanism to dispense a dose of viscous liquid from the reservoir 68, a partial vacuum is drawn in the reservoir and a pressure differential is established across the vent. This causes the vent plug to be pulled down or away from the vent orifice 242 against the force of the resilient member (i.e., spring 272). Once the vent plug unseats, pressure between the reservoir and the outside environment equalizes and the vent plug will subsequently reseat against the angled surface 264 until the next actuation of the pump mechanism. In this regard, it should be noted that the resilient member should be "sized" so that the vent plug can unseat from the vent orifice at the degree of vacuum generated inside the reservoir upon actuation of the pump mechanism. For example, if a spring 272 is utilized, such spring should not have a spring constant so great that the vent plug is prevented from unseating and equalizing pressure upon a user actuating the pump dispenser.

Figure 23 illustrates an alternate embodiment of the vent mechanism wherein the body member includes a skirt portion 274 extending upwardly into the upper vent passage 262. The skirt portion need not be continuous and may constitute circumferentially spaced fingers or tabs This skirt portion 274 includes a resilient rim member 276 upon which the vent plug (ball 246) rests. This embodiment operates essentially the same as described above except that the vent plug is biased by the skirt 274 and resilient rim member 276 instead of a spring.

Figure 24 illustrates an embodiment similar to that of Figur 23. However, in this embodiment, the vent plug is a resiliently disposed bulbous member 278 formed integral to at least a portion of the skirt

274. The bulbous member 278 is supported by the resilient rim member 276. Operation of this embodiment is similar to that described above.

As previously mentioned, a suitable pump mechanism for use in the dispenser according to the invention may include a self-contained device having a pump chamber housing that is fitted into a bore defined through a front wall surface of the housing so as to be in communication with the internal reservoir. Such an embodiment is illustrated in Figs. 15 through 29. This embodiment is similar in may aspects to the embodiment of Figs. 5 through 9 and, thus, the common features need not be described in detail.

Referring to Figs. 25 through 29, in this embodiment the housing 24 includes a bore 302 defined through a front surface 304. A generally cylindrical extension 312 may extend rearwardly from the front surface 304 into the reservoir. The extreme end of the cylinder extension 312 has a radially inward extending seal 310. As will be described in greater detail below, seal 310 seals against a chamber insert member. A plurality of nubs or protrusions 308 extend from the front surface 304 and surround the bore 302. The cylindrical extension 312, ring seal 310, and protrusions 308 may all be molded integrally with housing 24.

A chamber insert 314 is designed to fit through the bore 302. The insert 314 is shown particularly in Figs. 26 and 28 and may be a generally cylindrical member having an interior wall 325 defining an internal pump chamber 322. An opening 323 is defined through the forward end of the insert 314 through which a pump cylinder slides, as described below. The insert 314 includes a front outer flange 316 having a plurality of counter-bored holes 317 defined therethrough. The holes 317 align with the protrusions 308. The insert 314 is fitted through the bore 302 from the front side of the housing 24. The back side of the flange 316 is pressed

against th front surface 304 of the housing 24 and the protrusions 308 extend through the holes 317. The insert is permanently attached to the housing 24 by melting the protrusions 308 in a "heat stake" process so that the molten material flows into the counter-bored holes 317 and thus anchors the insert 314 upon hardening. It should be appreciated that many other suitable devices and methods could be used to anchor or secure the insert 314 relative to the housing 24.

The insert 314 has an outer circumferential surface 318 that, when slid through the bore 302 and cylindrical extension 312, is tightly engaged by the seal 310 at the end of the extension 312. Thus, a first seal between the insert 314 and housing 24 is formed in this way. A ring-like protrusion 321may be formed or otherwise provided around the surface 318 which engages in the groove 319 to give a positive indication that the insert 314 has been properly inserted. The ring 321 may be an O-ring and thus also provide a sealing capacity.

The insert 314 includes a radially outward extending portion 320 defined rearward of the back side of the outer flange 316. This portion 320 acts as a seal with the cylindrical extension 312, as particularly seen in Fig. 25. Thus, a second seal between the insert 314 and housing 24 is formed in this way.

The insert 314 includes an inner flange 326 defining the diameter of the opening 323, and an alignment tab 324 formed in the chamber 322. This tab 324 cooperates with a longitudinally extending channel or groove defined in the pump cylinder, as described below.

An alternate embodiment of pump cylinder is disclosed in Figs. 25 and 29. This pump cylinder embodiment may be used in the integrally molded pump chamber illustrated in Figs. 5 through 9 or the pump chamber insert 3i4. This embodiment includes a two-

part pump cylinder 340. The first component 342 is a generally cylindrical member having a channel 344 defined therethrough that terminates at a dispensing orifice 96 defined in the front end of the first component 342. The front end of the first component corresponds to the delivery end of the pump cylinder 340. A flange 354 is provided at the rearward end of first component 342 to prevent the pump cylinder 340 from being pulled out of the pump chamber 322. This flange 354 engages against the inner flange 326 of the insert 314 in the fully extended position of the pump cylinder 340 as illustrated in Fig. 25.

As with the embodiment of Figs. 5 through 9, a locking feature is provided for the pump cylinder 349. A longitudinal groove or channel 350 is defined along the outer surface of the first component 342 and is engaged by the alignment tab 324 of the insert 314 as the cylinder is slid longitudinally within the pump chamber 322. In this way, the pump cylinder 340 is prevented from rotating upon actuation and release thereof. A partial circumferential groove 352 is defined in the outer surface of the first component 342, as particularly illustrated in Fig. 25. The circumferential groove 352 is defined at a location corresponding to the pressurization position of the pump cylinder 340 within the pump chamber 322. For shipment of the dispenser, the pump cylinder 340 may be depressed and then rotated so that the tab 324 is engaged within the circumferential groove 352. In this configuration, the pump cylinder 340 is locked in the pressurization position and cannot move within the pump chamber 322 until the pump cylinder is rotated back into position so that the tab 324 is engaged within the longitudinal groove 350.

The first component 342 of the pump cylinder 340 also includes a flange seal 356 defined at the rearward end thereof. The flange seal 356 engages against the interior wall 325 of the insert

314 and nsures that the viscous liquid contained within th chamber 322 is pressurized and dispensed through the pump cylinder 340 upon movement of the cylinder from its rest position to the pressurization position and does not simply move from one end of the pump chamber to the other upon movement of the cylinder.

The second component of the pump cylinder 340 may be a plug member 346 that is fitted into a chamber 341 defined in the rearward side of the first component 342. The plug member 346 has a channel 348 defined therethrough that axially aligns with the channel 344 defined in the first component 342. The aligned channels 344 and 348 thus define the delivery channel through the pump cylinder 340. As shown in Fig. 29, the channel 348 may be open along the top thereof wherein a closed channel is formed by cooperation of the first component wall defining the chamber 341 and the open channel 348. A cup-shaped flange member 357 is defined at the rearward end of the plug member 346. The side wall of the flange member engages against the interior wall 325 of the insert 314 and thus defines a second flange seal 358 between the pump cylinder 340 and the pump chamber 322. The interior of the cup-shaped flange member 357 defines a recess or seat 362 against which a spring sits, as described below.

As with the embodiment of Figs. 5 through 9, a check valve is provided with the pump chamber 322 to ensure that the viscous liquid within the chamber 322 is not pushed out of the chamber upon movement of the pump cylinder 340 within the chamber. The check valve in this embodiment is a shuttle valve 392 having radially extending and spaced apart arms 336. The shuttle valve 392 is slidably disposed within an opening defined through an end cap 328. The space between the radial arms 336 is open to the reservoir to that the liquid can flow from the reservoir into the

pump chamber 322 upon movement of the pump cylinder 340 to the forward end of the pump chamber 322. A sealing cap 334, such as an elastomeric cap, is provided on the forward end of the shuttle valve 392 to ensure that the opening in the end cap 328 is sealed upon actuation of the pump and rearward movement of the pump cylinder 340 within the chamber 322 to its pressurization position. The cap 334 seals against the forward end of a cylindrical extension 338 of the end cap 328. An open cage member 330 extends from the end cap 328 into the reservoir and surrounds the radial arms 336.

The pump cylinder 340 is biased with the pump chamber 322 to its rest position by way of a spring 360. Other types of resilient devices, such as a leaf spring, spring washer, and the like, may be utilized for this purpose. The spring 360 has a forward end seated in the recess 362 of the cup-shaped flange member 357 of the plug member 346. The opposite end of the spring 360 is fitted around the cylindrical extension 338 of the end cap 328.

The end cap 328 is permanently fixed (i.e., by welding, adhesive, etc.) to the rearward end of the chamber insert 314 after the pump cylinder 340 and spring 360 are inserted into the insert from its rearward end.

As with the embodiment of Figs. 5 through 9, it may be desired to include a valve mechanism within the delivery end of the pump cylinder 340 to prevent leakage of viscous liquid from the dispenser. A particularly useful sealing valve is the type of valve illustrated and described with respect to Figs. 9a and 9b.

Operation of the embodiment depicted in Figs. 25 through 29 is substantially the same as described above with respect to the embodiment of Figs. 5 through 9 and thus need not be set forth again in detail.

The pump mechanism of Figs. 25 through 29 may be

desirable from a manufacturing and assembly standpoint. It may also be desirable to be able to remove the pump mechanism from the housing and recycle or reuse the pump mechanism. In this case, it might be preferred to provide a more readily "breakable" or disconnectable attachment between the chamber insert 314 and the housing 24. Although within the scope and spirit of the invention, with the embodiment of Figs. 25 through 29 it might prove prohibitive to break the heat stake welds between the chamber insert 314 and front surface 304 of the housing 24 to remove the insert 314.

It should be appreciated that the invention includes modifications and variations to the embodiments of the invention described herein.

WHAT IS CLAIMED IS:

1. A self contained viscous liquid dispenser, comprising:

a housing;

an internal liquid reservoir defined by said housing;

a dispensing pump mechanism disposed at least partially within said reservoir and having a delivery end extending out of said reservoir; and

a mounting mechanism configured as an integral component of said housing, said mounting mechanism detachably connectable with complimentary mounting structure on a wall surface.

2. The dispenser as in claim 1, wherein said housing comprises a substantially vertical back side, said mounting mechanism configured in said back side.

3. The dispenser as in claim 2, wherein said mounting mechanism comprises a recess defined in said back side, said recess further comprising side walls having engaging structures defined thereon for engagement with complimentary structure provided on the wall mounting structure.

4. The dispenser as in claim 3, wherein said side walls comprise at least two vertical walls, said engaging structure comprising at least one angled surface disposed on each of said vertical side wall that engages against a complimentary angled surface of the wall mounting structure.

5. The dispenser as in claim 4, wherein said housing is slidable in a generally vertical direction onto the wall mounting structure, said angled surfaces sliding into engagement with the complimentary angled surfaces on the wall mounting structure such that said housing cannot be pulled away from the wall structure.

6. The dispenser as in claim 5, further comprising a securing device configured on said back side of said housing to prevent sliding movement of said housing relative to the wall mounting

structure upon engagement of said angled surfaces with the wall mounting structure.

7. The dispenser as in claim 6, wherein said securing device comprises a protrusion disposed on said back side, said protrusion engageable in a complimentary divot defined in the wall mounting structure.

8. The dispenser as in claim 4, comprising at least two spaced apart said angled surfaces on each said vertical wall, said spaced apart angled surfaces engaging against complimentary spaced apart angled surfaces on the wall mounting structure.

9. The dispenser as in claim 8, wherein said housing is slidable in a generally vertical direction onto the wall mounting structure, said spaced apart angled surfaces sliding into engagement with the complimentary spaced apart angled surfaces on the wall mounting structure such that said housing cannot be pulled away from the wall structure.

10. The dispenser as in claim 9, further comprising a securing device configured on said back side of said housing to prevent sliding movement of said housing relative to the wall mounting structure upon engagement of said angled surfaces with the wall mounting structure.

11 The dispenser as in claim 10, wherein said securing device comprises a protrusion disposed on said back side, said protrusion engageable in a complimentary divot defined in the wall mounting structure.

12. The dispenser as in claim 1, wherein said housing comprises a front component formed separately from and adhered to a back component.

13. The dispenser as in claim 12, wherein said back component is more rigid than said front component.

14. The dispenser as in claim 13, wherein said back component has a thickness greater than said front component.

15. The dispens r as in claim 12, wherein said back component is substantially translucent so that an operator can view the amount of liquid within said reservoir.

16. The dispenser as in claim 1, wherein said housing comprises a portion that can be seen through by an operator to determine the amount of liquid within said reservoir.

17. The dispenser as in claim 1, wherein said housing is a molded plastic component.

18. The dispenser as in claim 1, further comprising an actuator configured with a forward end of said pump mechanism delivery end, said actuator moveable relative to said housing.

19. The dispenser as in claim 18, wherein said actuator comprises a panel member pivotally connected to said housing and in contact against said forward end of said pump mechanism delivery end.

20. The dispenser as in claim 18, wherein said actuator is attached to said forward end of said pump mechanism.

21. The dispenser as in claim 1, wherein said pump mechanism comprises a cylinder having a delivery channel defined therethrough, said cylinder being slidable within a substantially horizontally disposed chamber defined within said reservoir on a bottom surface of said housing.

22. The dispenser as in claim 21, wherein said chamber is formed integral with said housing.

23. The dispenser as in claim 1, further comprising a wall mounting member that is releasably engageable with said housing mounting mechanism, said wall mounting member attachable to a supporting wall surface.

24. The dispenser as in claim 23, wherein said wall mounting member comprises a plate member having side edges that are interlockingly engageable with said mounting mechanism.

25. A disposable viscous liquid dispenser, comprising:

a housing defining an internal integral liquid reservoir, said housing further comprising a back side configured for placement against a supporting wall surface;

a dispensing pump mechanism disposed at least partially within said reservoir and comprising an operable delivery end for dispensing the viscous liquid from said housing;

a mounting mechanism formed integral with said back side, said mounting mechanism comprising engagement surfaces configured to releasably interlock with complimentary structure of a wall mounting member provided on a supporting wall so that said housing cannot be pulled away from the supporting wall.

26. The dispenser as in claim 25, wherein said mounting mechanism comprises a recess defined in said back side, said recess further comprising side walls having said engagement surfaces defined thereon.

27. The dispenser as in claim 26, wherein said side walls comprise at least two vertical walls, said engagement surfaces comprising at least one angled surface disposed on each of said vertical side walls that slidably engages against a complimentary angled surface of the wall mounting member.

28. The dispenser as in claim 27, wherein said housing is slidable in a generally vertical direction onto the wall mounting member, said angled surfaces sliding into engagement with the complimentary angled surfaces on the wall mounting member.

29. The dispenser as in claim 28, comprising at least two spaced apart said angled surfaces on each said vertical wall, said spaced apart angled surfaces engaging against complimentary spaced apart angled surfaces on the wall mounting member.

30. The dispenser as in claim 28, further comprising a securing device configured on said back side of said housing to prevent sliding movement of said housing relative to the wall mounting member upon engagement of said angled surfaces with the wall

mounting member.

31. Th dispenser as in claim 30, wherein said securing device comprises a protrusion disposed on said back side, said protrusion engageable in a complimentary divot defined in the wall mounting structure.

32. A disposable liquid soap dispenser, comprising:

a housing defining an internal integral liquid soap reservoir, said housing further comprising a back side configured for placement against a supporting wall surface;

a dispensing pump mechanism disposed at least partially within said reservoir and comprising an operable delivery end for dispensing liquid soap from said housing;

a mounting mechanism formed integral with said back side, said mounting mechanism comprising engagement surfaces configured to releasably interlock with complimentary structure of a wall mounting member provided on a supporting wall so that said housing cannot be pulled away from the supporting wall, said mounting mechanism comprising a recess defined in said back side, said recess further comprising at least two vertical side walls having at least one angled surface disposed on each of said vertical side walls, said housing being slidable in a generally vertical direction onto the wall mounting member, said angled surfaces sliding into engagement with complimentary angled surfaces on the wall mounting member; and

a protrusion disposed on said back side of said housing, said protrusion engageable in a complimentary divot defined in the wall mounting structure.

33. A disposable viscous liquid dispenser, comprising:

a housing defining an internal liquid reservoir, said housing further comprising a back side configured for placement against a supporting wall surface;

a pump chamber formed integral with said housing within said reservoir, said chamber having a back end open to said res rvoir and a

front end open to the outside of said housing;

a pump cylinder slidably disposed and retained in said chamber, said pump cylinder having a channel defined therethrough and a delivery end extending out of said front end of said chamber;

an actuator configured with said delivery end so that said pump cylinder is operable from outside of said housing;

a valve mechanism disposed in said delivery end of said pump cylinder and configured to permit dispensing of viscous liquid out of said pump cylinder upon an operator actuating said actuator and to close upon release of said actuator to prevent leakage or dripping of liquid from said pump cylinder.

34. The dispenser as in claim 33, wherein said pump cylinder is insertable into said pump chamber from said back end, said chamber further comprising retaining structure at said front end to prevent withdrawal of said pump cylinder from said pump chamber through said front end.

35. The dispenser as in claim 34, further comprising a cap member attachable to said back end of said pump chamber upon insertion of said pump cylinder within said pump chamber.

36. The dispenser as in claim 35, further comprising an orifice defined through said cap member for drawing viscous liquid into said pump chamber, and a shuttle valve device disposed in said orifice to close said orifice upon actuation of said actuator.

37. The dispenser as in claim 33, wherein said valve mechanism comprises at least one flexible flap member that is movable to an open position upon actuation of said actuator and automatically returns to a closed position upon release of said actuator.

38. The dispenser as in claim 37, further comprising a plurality of said flap members that define an opening therethrough in said open position and seal against each other in said closed position.

39. The dispenser as in claim 33, wherein said housing

comprises a molded bottom surface, said pump chamber molded integral with said bottom surface.

40. The dispenser as in claim 33, wherein said actuator comprises a panel member pivotally connected to said housing and in contact against said delivery end of said pump cylinder.

41. The dispenser as in claim 33, wherein said actuator is attached directly to said delivery end of said pump cylinder.

42. A self contained viscous liquid dispenser, comprising:

a housing;

an internal liquid reservoir defined by said housing, said reservoir defining a volume capacity for said dispenser;

a manually operated dispensing pump mechanism disposed in liquid communication with said reservoir and having a delivery end disposed for delivering metered doses of viscous liquid from said reservoir upon actuation thereof by a user;

a mounting mechanism formed integrally in said housing, said mounting mechanism detachably connectable with complimentary mounting structure on a wall surface such that upon mounting said housing, a back side of said housing is generally flush with the wall surface;

said housing and associated pump mechanism having a combined packaging weight in grams; and

wherein a ratio of said packaging weight in grams to said volume capacity in liters does not exceed about 120:1.

43. The dispenser as in claim 42, wherein said ration does not exceed about 100:1.

44. The dispenser as in claim 43, wherein said volume capacity is about 2.5 liters.

45. The dispenser as in claim 42, wherein at a first volume capacity said ratio is greater than at a second volume capacity that is greater than said first volume capacity.

46. A viscous liquid dispenser, comprising:

a housing;

an internal liquid reservoir defined by and within said housing, said reservoir containing a volume of viscous liquid, said reservoir sealed to prevent access to said reservoir;

a manually operated dispensing pump mechanism disposed in liquid communication with said reservoir, said pump mechanism having a delivery end disposed relative to said housing to deliver metered doses of viscous liquid from said reservoir upon actuation thereof by a user;

said housing further comprising at least a portion thereof formed from a substantially clear or translucent material, said portion extending vertically from a location generally adjacent a bottom of said reservoir; and

whereby the level of viscous liquid remaining within said reservoir is determined by viewing the level through said portion.

47. The dispenser as in claim 46, wherein said viewing portion extends vertically at least about half-way up the vertical height of said reservoir.

48. The dispenser as in claim 46, wherein said viewing portion is formed from a different material from remaining portions of said housing.

49. The dispenser as in claim 48, wherein said housing comprises a front component formed separately from and permanently attached to a back component, at least a substantial portion of said back component being formed of said substantially clear or translucent material and acting as said viewing portion.

50. The dispenser as in claim 49, wherein said back component is formed entirely of said substantially clear or translucent material and defines an entire back wall of said reservoir.

51. The dispenser as in claim 49, wherein said back component comprises side edges viewable from a side of said housing.

52. The dispenser as in claim 49, wherein said back and front components are separately molded plastic components.

53. The dispenser as in claim 52, wherein said back component is more rigid than said front component.

54. The dispenser as in claim 53, wherein said back component has a thickness greater than that of said front component.

55. A viscous liquid dispenser, comprising:

a housing defining an internal integral liquid reservoir;

a manually operated dispensing pump mechanism carried by said housing and disposed in liquid communication with said internal reservoir, said pump mechanism having a delivery end disposed relative to said housing for delivering metered doses of viscous liquid from said reservoir upon actuation thereof by a user;

a mounting recess defined in a back wall of said housing, said recess circumscribed entirely by said back wall so as not to be visible from any side of said housing upon mounting said dispenser on a supporting wall, said recess further comprising first interlock surfaces;

a mounting bracket configured for attachment to a supporting wall surface, said bracket comprising complimentary second interlock surfaces shaped to releasably engage and interlock with said first interlock surfaces in said mounting recess; and

said bracket comprising a shape so as to fit substantially entirely within said mounting recess, said bracket further comprising at least one dimensional characteristic that is larger than the corresponding dimensional characteristic of said mounting recess such that said recess is caused to deform upon mounting said housing to said bracket to accommodate said corresponding dimensional characteristic thereby resulting in a secure engagement between said bracket and said housing.

56. The dispenser as in claim 55, wherein said mounting recess comprises side walls having said first interlock surfaces defined thereon.

57. The dispenser as in claim 56, wherein said first interlock surfaces includes at least one angled surface disposed on at least one of said side walls, and said second interlock surfaces include a corresponding number of complimentary angled surfaces provided on said mounting bracket.

58. The dispenser as in claim 57, wherein said first interlock surfaces includes at least one angled surface disposed on each of opposite vertical side walls of said recess, and said second interlock surfaces includes include a corresponding number of complimentary angled surfaces on opposite vertical side walls of said bracket.

59. The dispenser as in claim 58, comprising at two spaced apart angled surfaces on each of said mounting recess vertical walls, and at least two corresponding angled surfaces on said bracket vertical walls.

60. The dispenser as in claim 55, further comprising a securing device operably configured between said mounting recess and said bracket, said securing device preventing sliding movement between said bracket and said back wall of said housing.

61. The dispenser as in claim 60, wherein said securing device comprises a protrusion on one of said bracket and said mounting recess, and a complimentary divot on the other of said bracket and said mounting recess.

62. The dispenser as in claim 55, wherein said housing is slidable in a generally vertical direction onto said mounting bracket.

63. The dispenser as in claim 55, wherein said housing comprises a front component formed separately from and permanently attached to a back component, said mounting recess defined in a back wall of said back component.

64. The dispenser as in claim 63, wherein said back component is substantially translucent so that the amount of liquid within said reservoir is visible through said back component.

65. The dispenser as in claim 55, wherein said housing is a

molded plastic component.

66. A self contained viscous liquid dispenser, comprising:

a housing;

an internal liquid reservoir defined by said housing;

a manually operated dispensing pump mechanism disposed in liquid communication with said reservoir and having a delivery end disposed for delivering metered doses of viscous liquid from said reservoir upon actuation thereof by a user;

a mounting mechanism formed integrally in said housing, said mounting mechanism detachably connectable with complimentary mounting structure on a wall surface such that upon mounting said housing, a back side of said housing is generally flush with the wall surface; and

a vent mechanism disposed in an upper wall of said housing, said vent mechanism further comprising a vent passage and a movable plug member resiliently disposed in said vent passage, said plug member sealing an orifice into said vent passage in an at-rest position and movable to unseal said orifice and vent said reservoir upon a sufficient vacuum being established in said reservoir upon actuation of said pump mechanism.

67. The dispenser as in claim 66, wherein said vent mechanism includes a body member insertable through an opening in said housing wall.

68. The dispenser as in claim 67, wherein said body member further includes at least one resilient member configured to engage and lock said body member to said housing wall.

69. The dispenser as in claim 68, wherein said body member includes at least one resilient tab disposed to engage against an inner surface of said housing wall and exert an inward pulling force on said body member.

70. The dispenser as in claim 69, including a plurality of said resilient tabs circumferentially spaced around said body m mber.

71. The dispenser as in claim 68, wherein said body member further includes a cap, said vent orifice defined through said cap, said cap further comprising a radially extending resilient circumferential lip that sealingly engages against said housing wall.

72. The dispenser as in claim 71, wherein said cap is disposed above an upper surface of said housing wall, said resilient lip sealingly engaging against said upper surface.

73. The dispenser as in claim 71, wherein said cap in disposed in a counterbore defined in said housing wall, said resilient lip sealingly engaging against a circumferential wall of said counterbore.

74. The dispenser as in claim 71, wherein said cap further comprises a downwardly extending resilient annual skirt that sealingly engages against said housing wall.

75. The dispenser as in claim 74, wherein said resilient annual lip engages against a circumferential side of said opening in said housing wall.

76. A self contained viscous liquid dispenser, comprising:

a housing defining an internal liquid reservoir, said housing including a front surface having an opening therethrough adjacent a bottom surface of said reservoir;

an insert member fitted through said opening, said insert extending into said reservoir and defining an internal pump chamber having a back end open to said reservoir and a front end open to the outside of said housing, said insert attached to said housing at said front surface;

a pump cylinder slidably disposed and retained in said chamber, said pump cylinder having a delivery end extending out of said pump chamber and a delivery channel defined therethrough terminating at a dispensing orifice in said delivery end, said pump cylinder movable within said pump chamber from a rest position to a pressurizing position to pressurize and dispense liquid within said pump chamber through said delivery channel and out said dispensing orifice; and

an actuator configured with said delivery end of said pump cylinder to move said pump cylinder from said rest position to said pressurizing position from outside of said housing.

77. The dispenser as in claim 76, wherein said pump cylinder is insertable into said pump chamber from said back end, said chamber further comprising retaining structure at said front end to prevent withdrawal of said pump cylinder from said pump chamber through said front end.

78. The dispenser as in claim 77, further comprising an end cap attachable to said back end of said pump chamber upon insertion of said pump cylinder within said pump chamber.

79. The dispenser as in claim 76, wherein said pump cylinder comprises a first component having a first channel defined therethrough, and a second component fitted into said first component and having a second channel defined therethrough that is axially aligned with said first channel, said first and second channels defining said delivery channel through said pump cylinder.

80. The dispenser as in claim 79, wherein said first component further comprises a first radially extending seal that slidably engages along an inner wall of said insert member defining said pump chamber, and said second component further comprises a second radially extending seal that also slidably engages along said inner wall of said insert member.

81. The dispenser as in claim 76, wherein said housing comprises a plurality of protrusions extending from said front surface and disposed around said opening, and insert member comprises a front flange having a plurality of holes defined therethrough into which said protrusions extend upon mounting said insert member into said housing.

82. The dispenser as in claim 81, wherein said holes are counter-sunk and said protrusions have been melted so as to flow into said holes to permanently retain said insert member relative to said

housing.

83. The dispenser as in claim 76, further comprising at least one seal disposed between an outer surface of said insert member and said housing.

84. The dispenser as in claim 83, wherein said at least one seal comprises a radially inward extending seal disposed around said opening in said housing that engages and seals against said outer surface of said insert member.

85. The dispenser as in claim 84, wherein said opening in said housing is defined by a cylindrical extension that extends from said front surface into said reservoir, said radially extending seal disposed on said cylindrical extension.

86. The dispenser as in claim 83, wherein said insert member comprises a radially outward extending seal disposed at a forward end thereof that engages and seals against a portion of said housing defining said opening.

87. The dispenser as in claim 76, further comprising a first and a second seal between an outer surface of said insert member and said housing, said first seal comprising a radially inward extending seal disposed around said opening in said housing that engages and seals against said outer surface of said insert member, and said second seal comprising a radially outward extending seal disposed at a forward end of said insert member that engages and seals against a portion of said housing defining said opening.

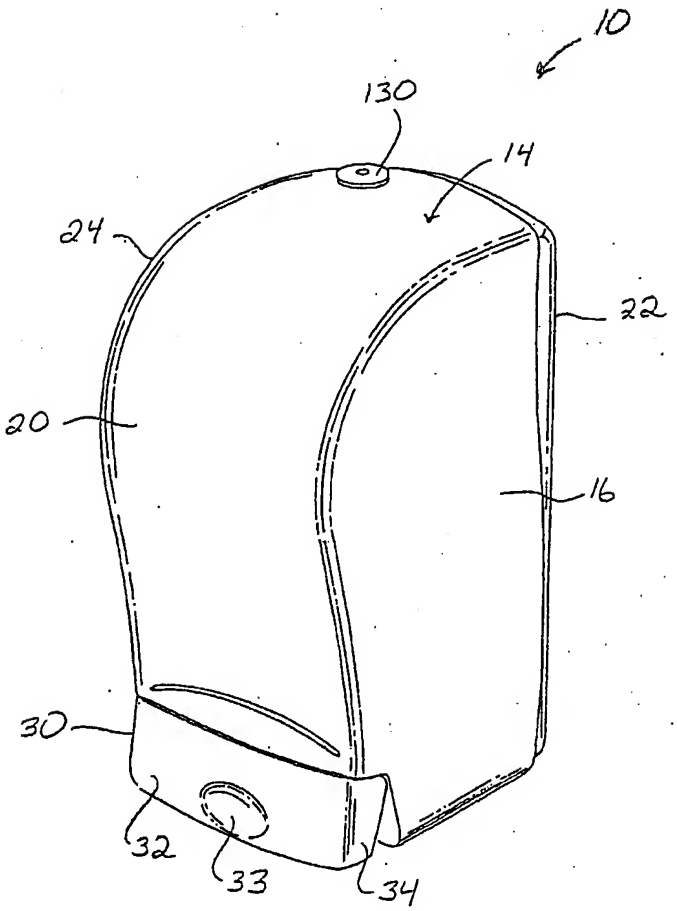


Fig. 1

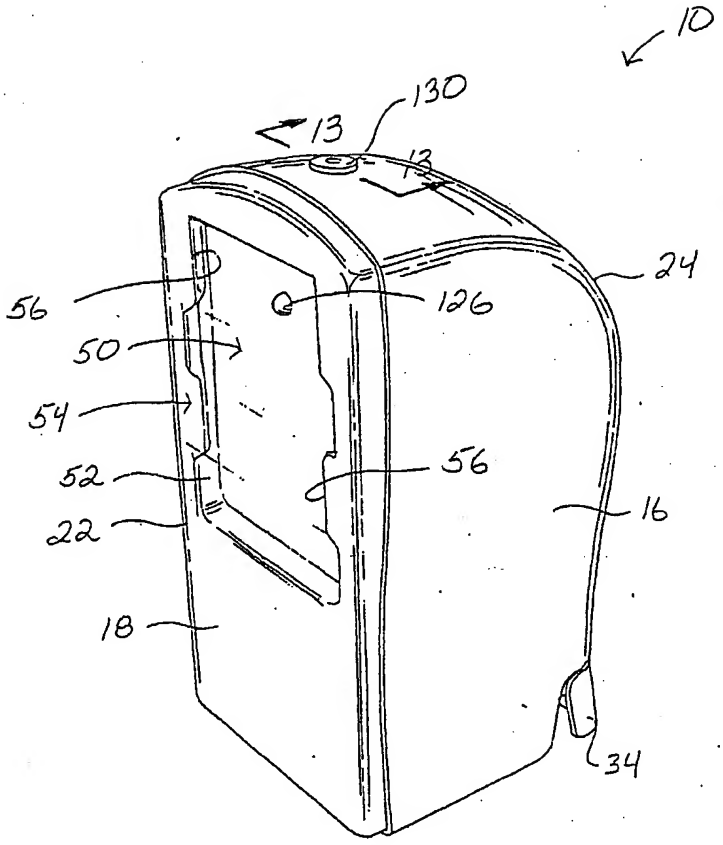
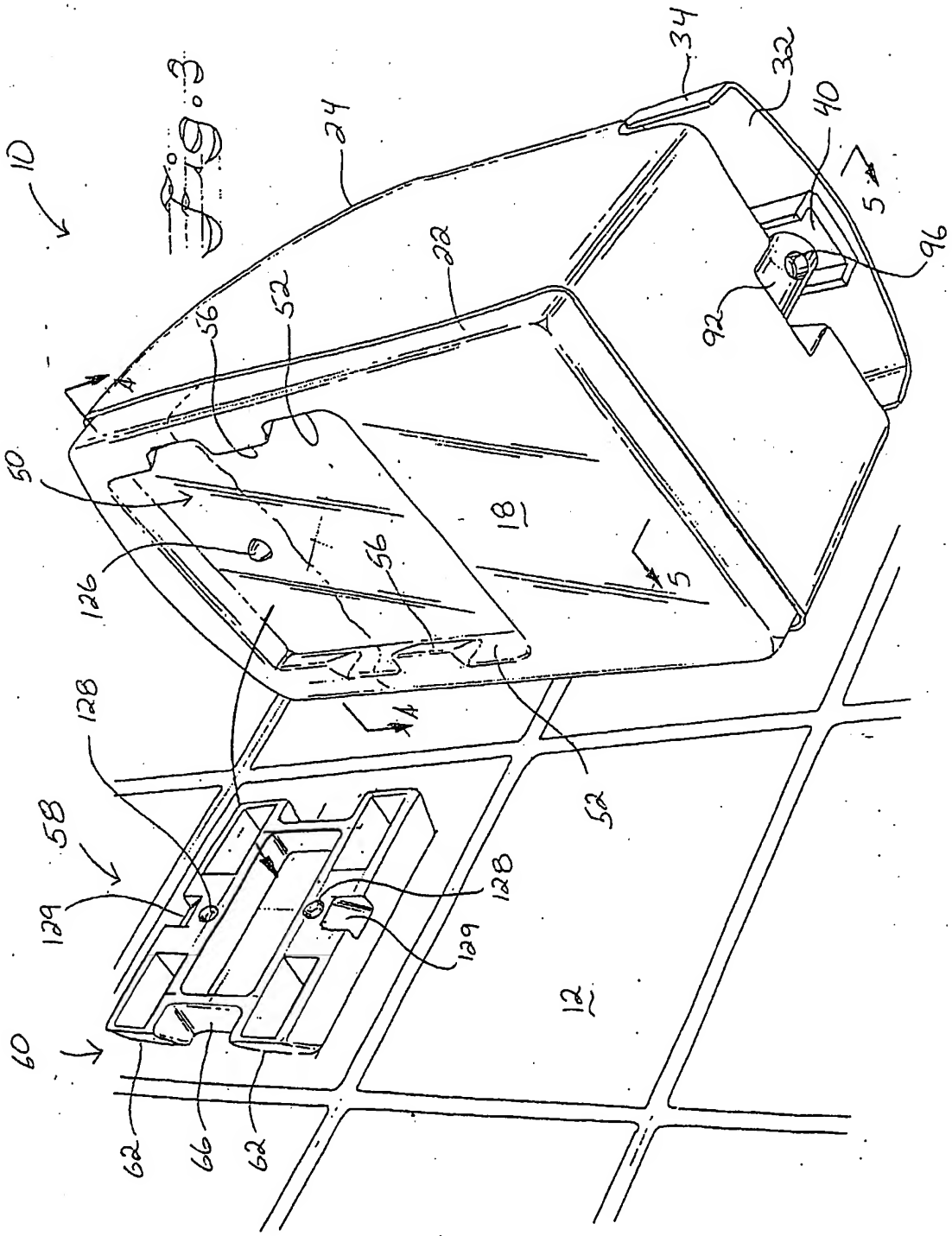


Fig. 2

Fig. 3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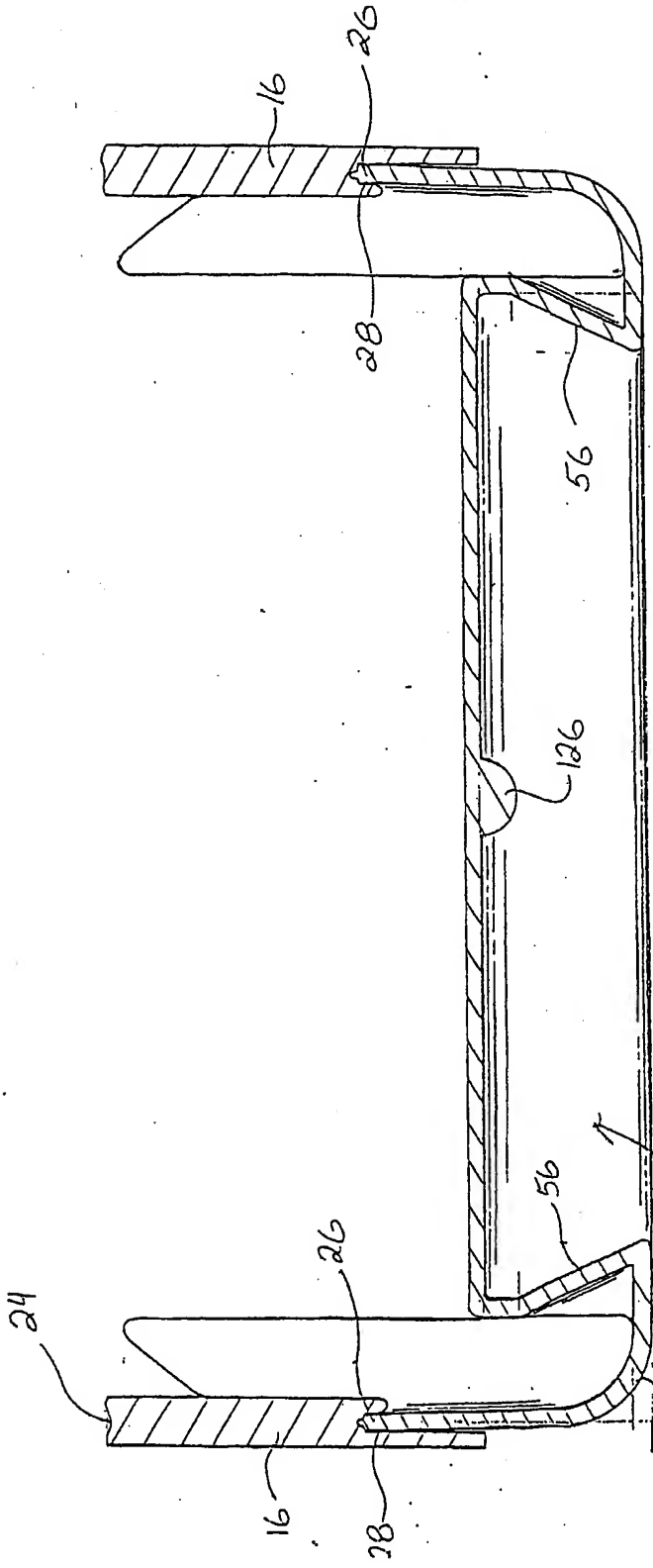

FIG. 4

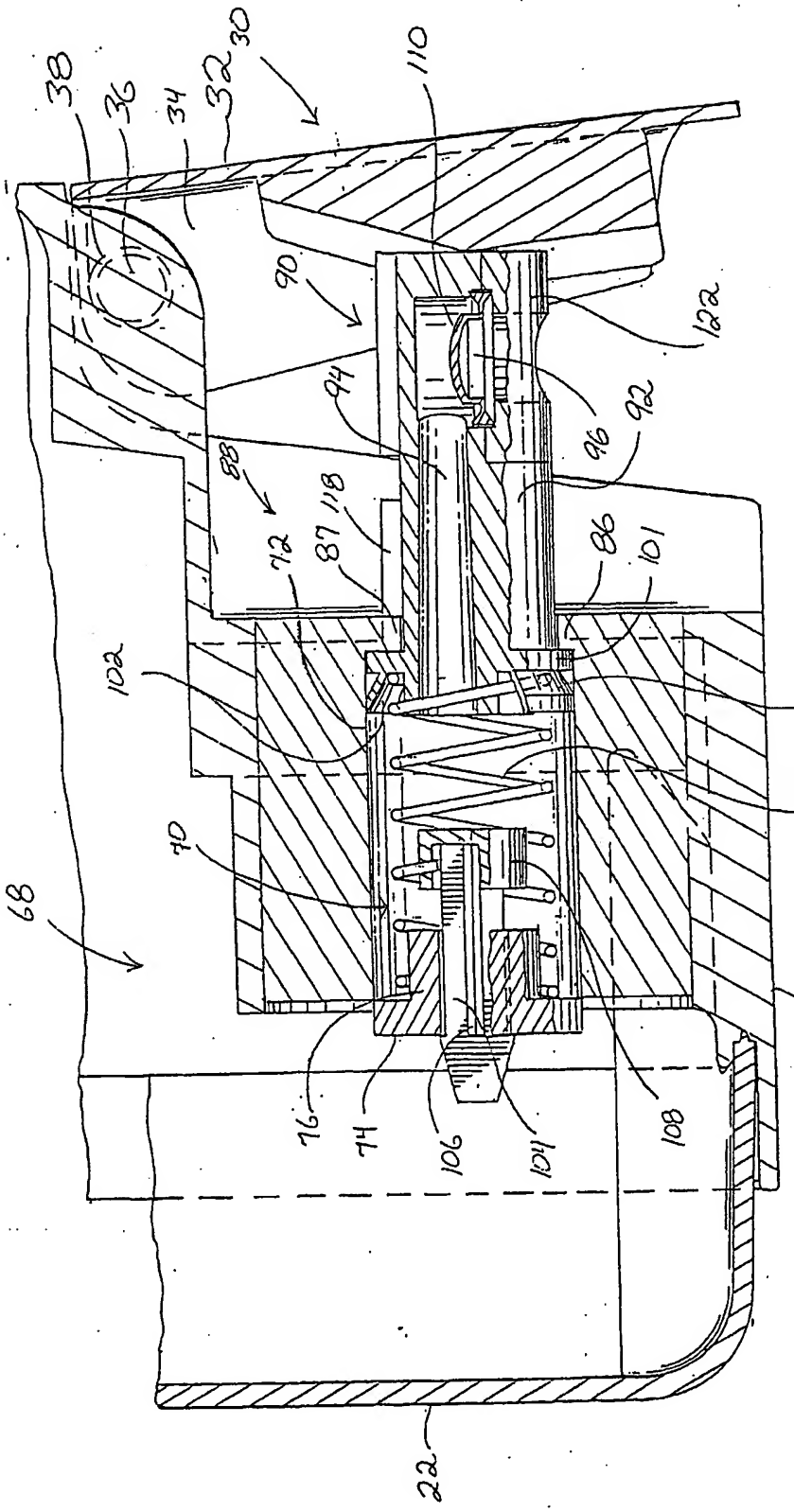
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Fig. 5

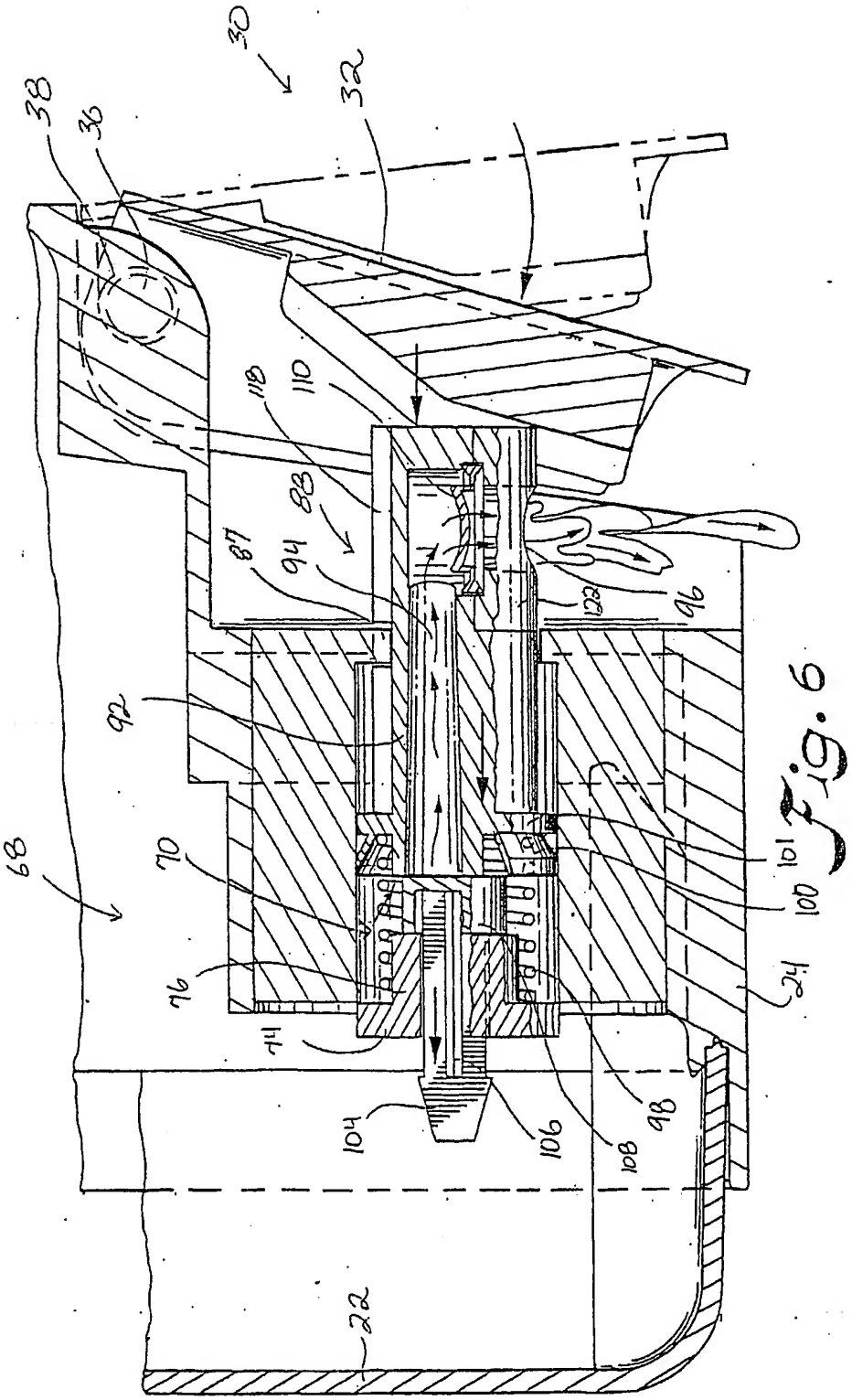
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Fig. 6

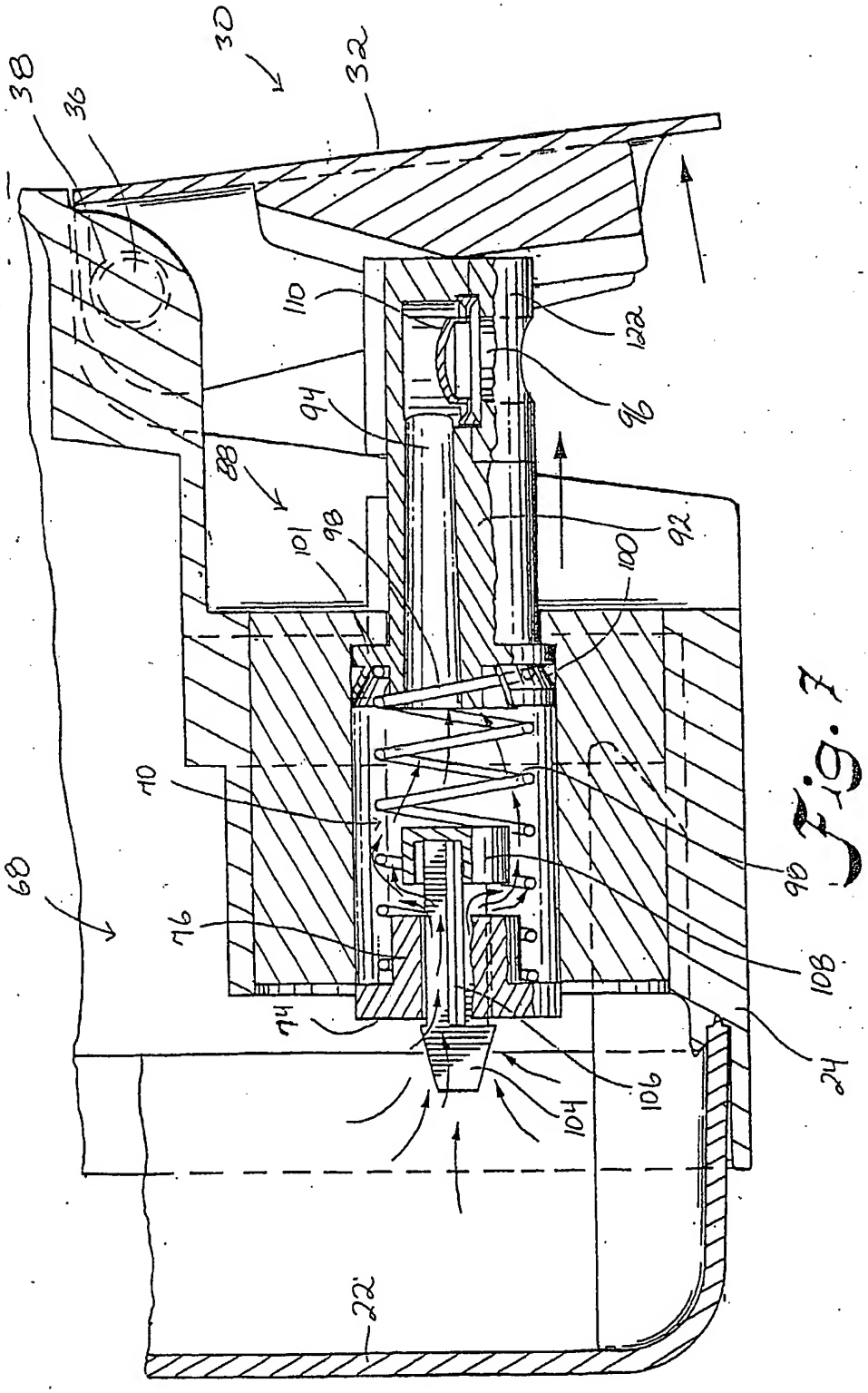
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Fig. 7

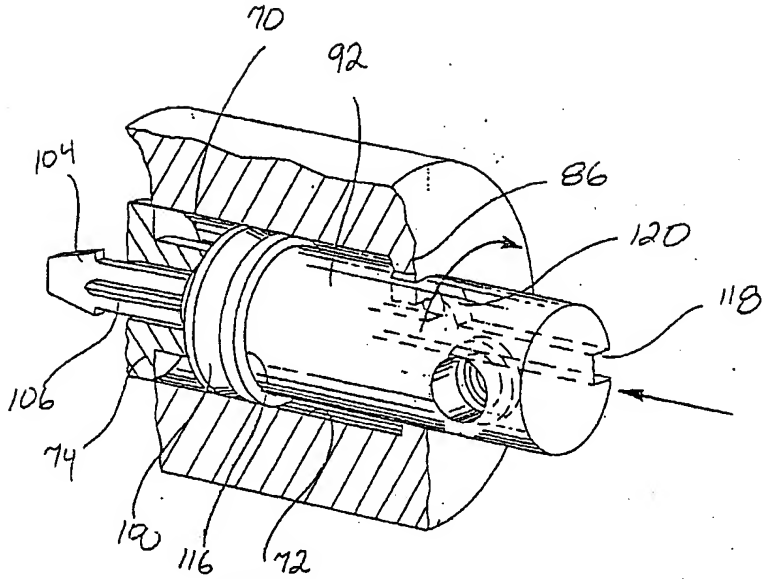

Fig. 8B

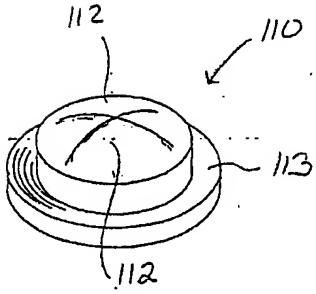

Fig. 9A

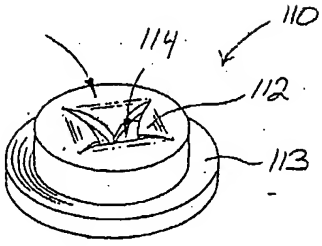

Fig. 9B

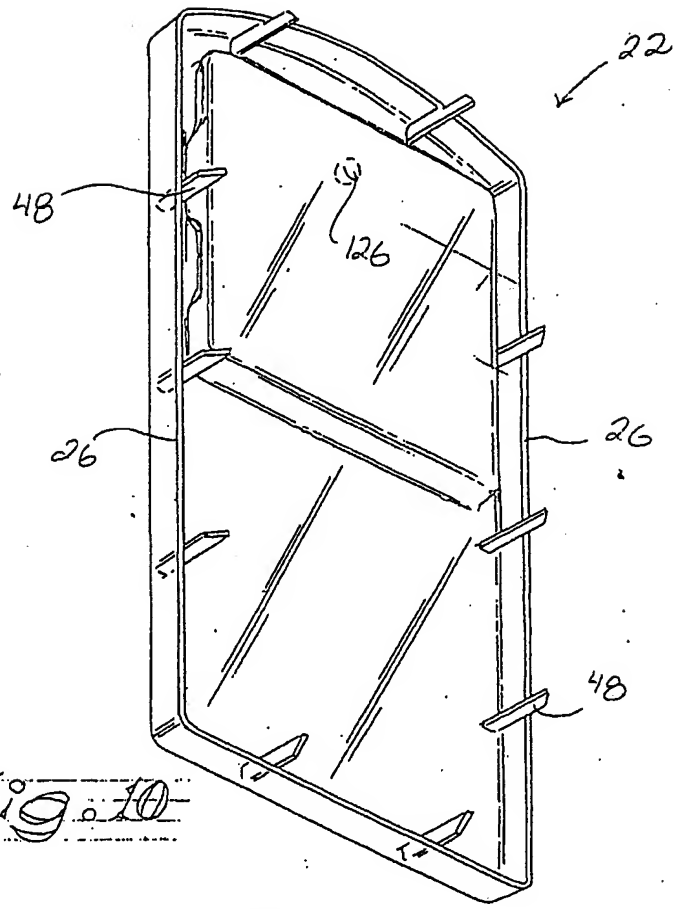

Fig. 10

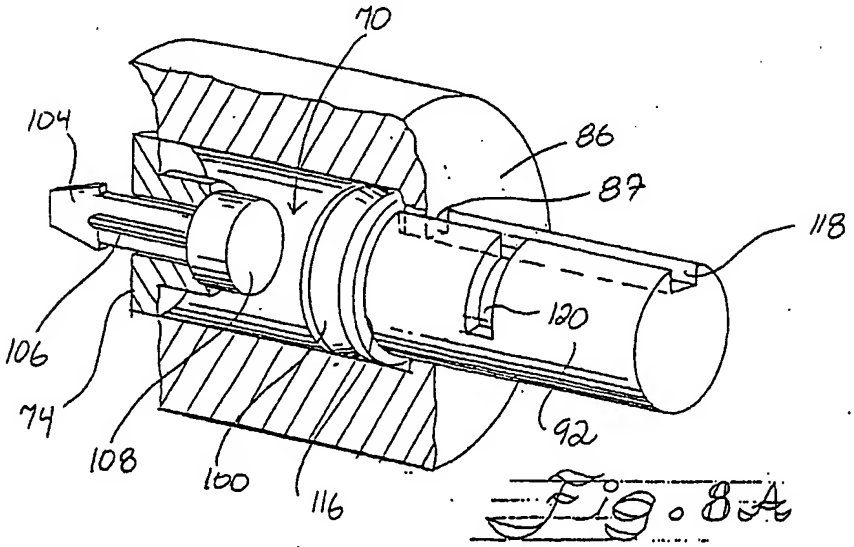

Fig. 8A

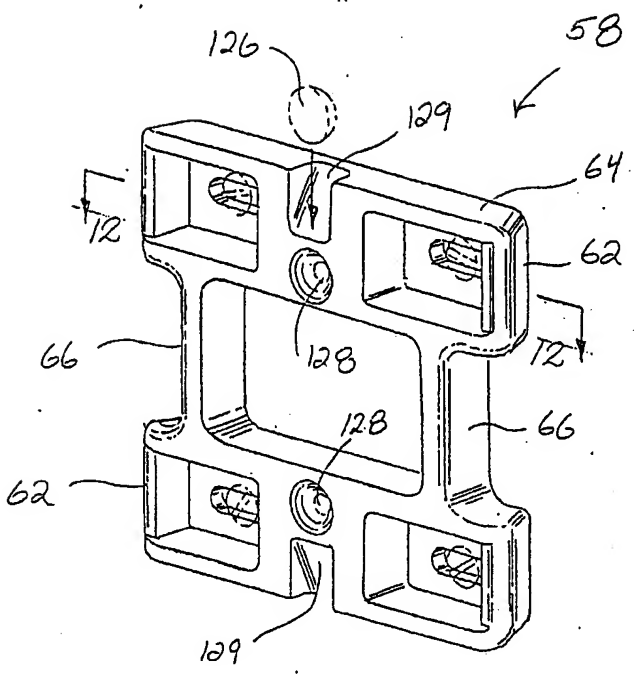

Fig. 11

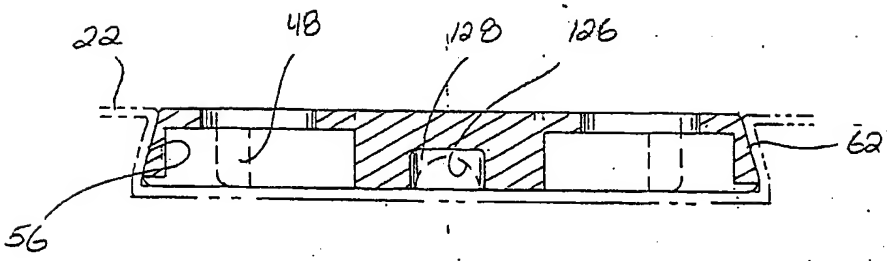

Fig. 12

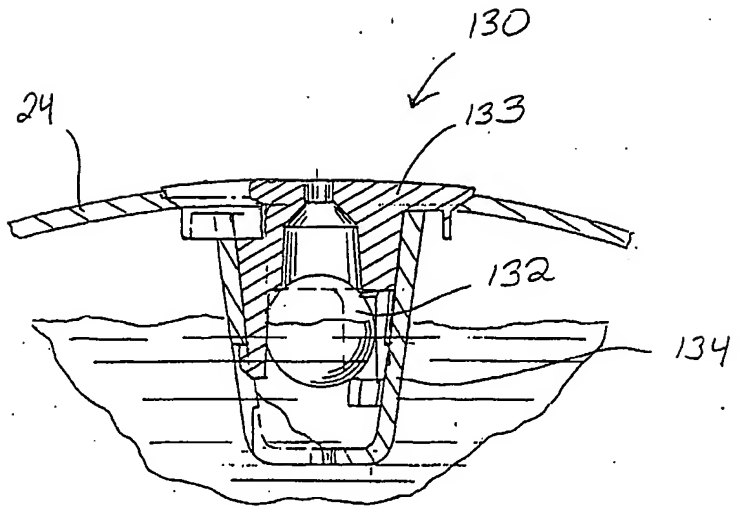

Fig. 13

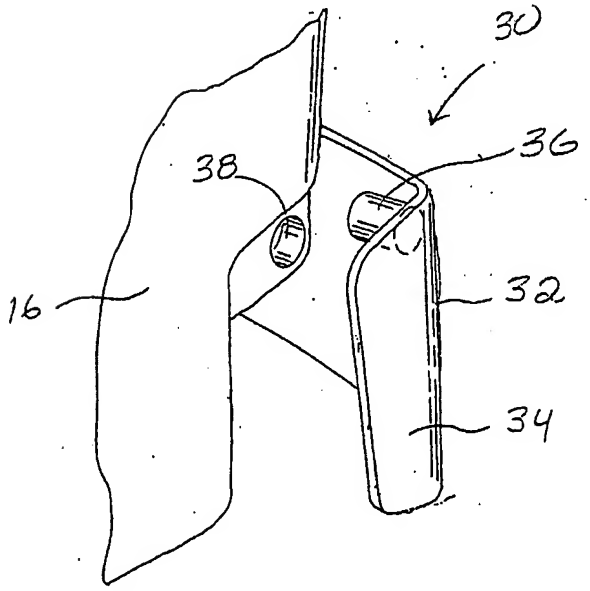

Fig. 14

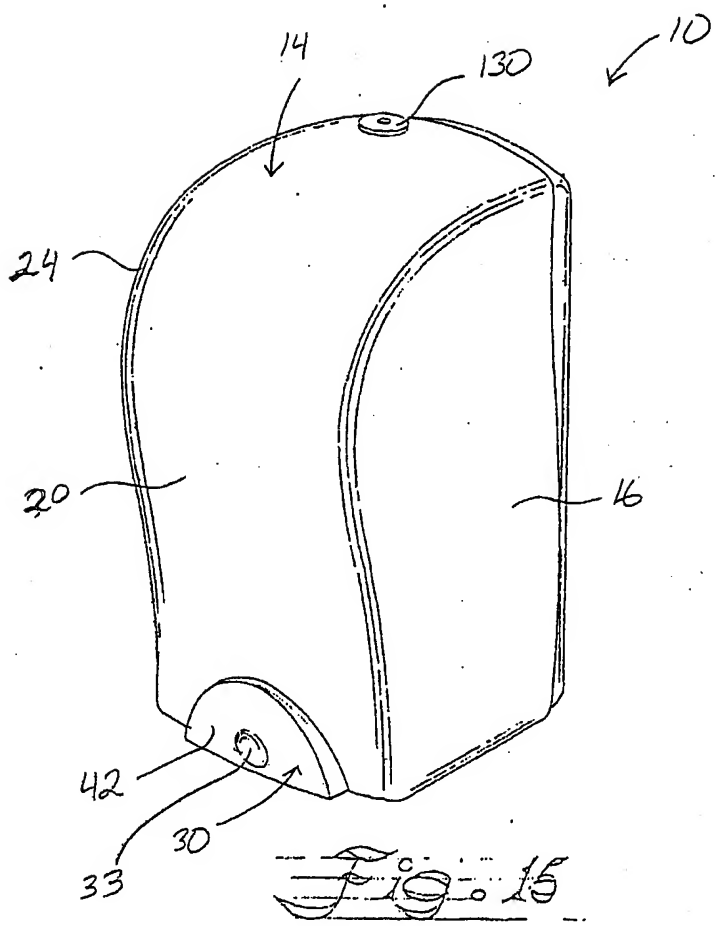

Fig. 15

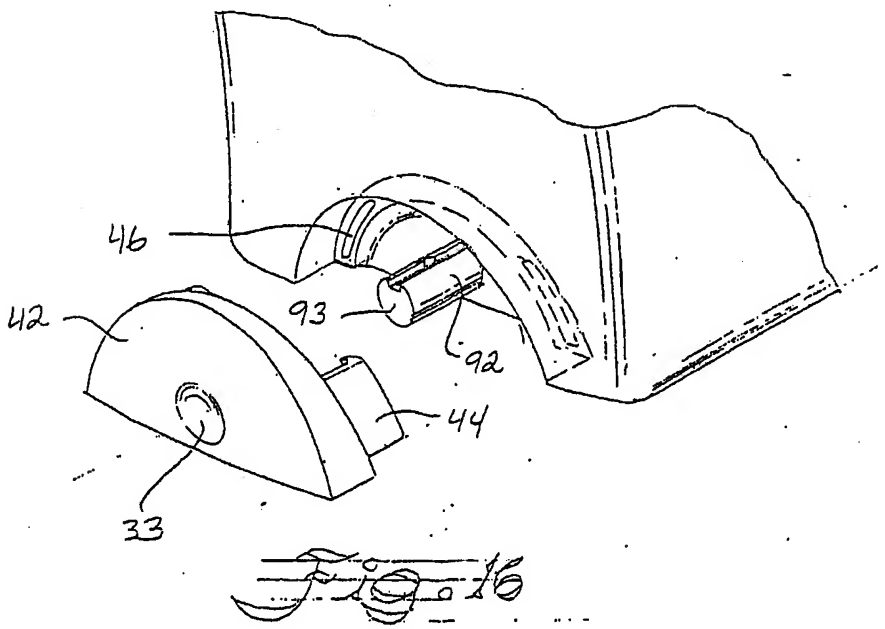

Fig. 16

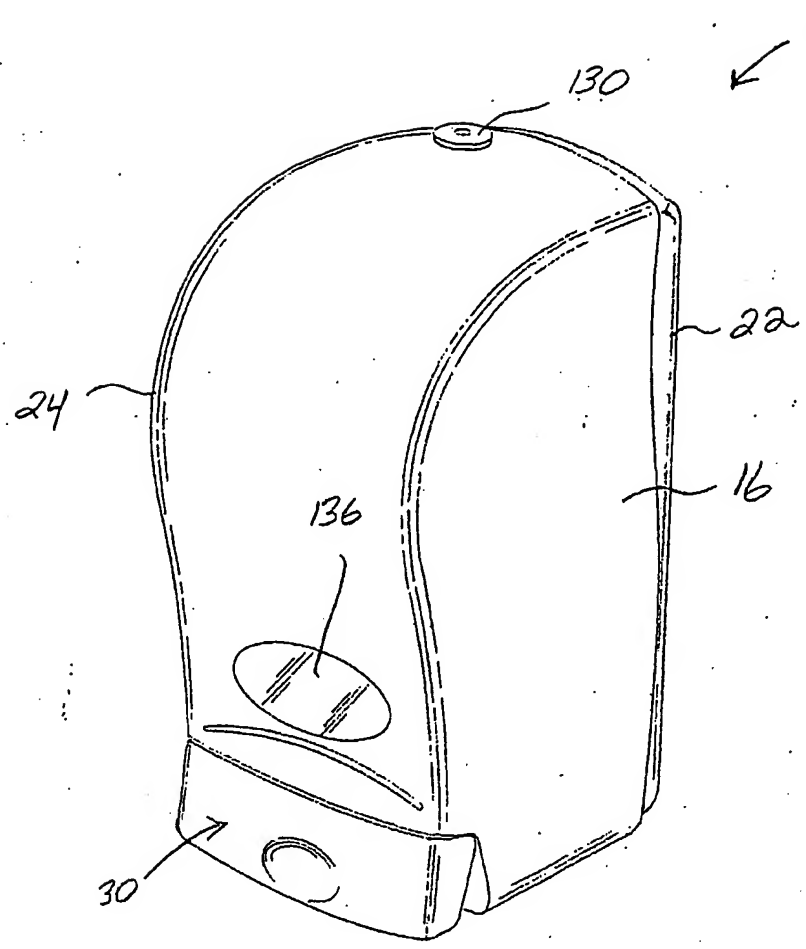

Fig. 17

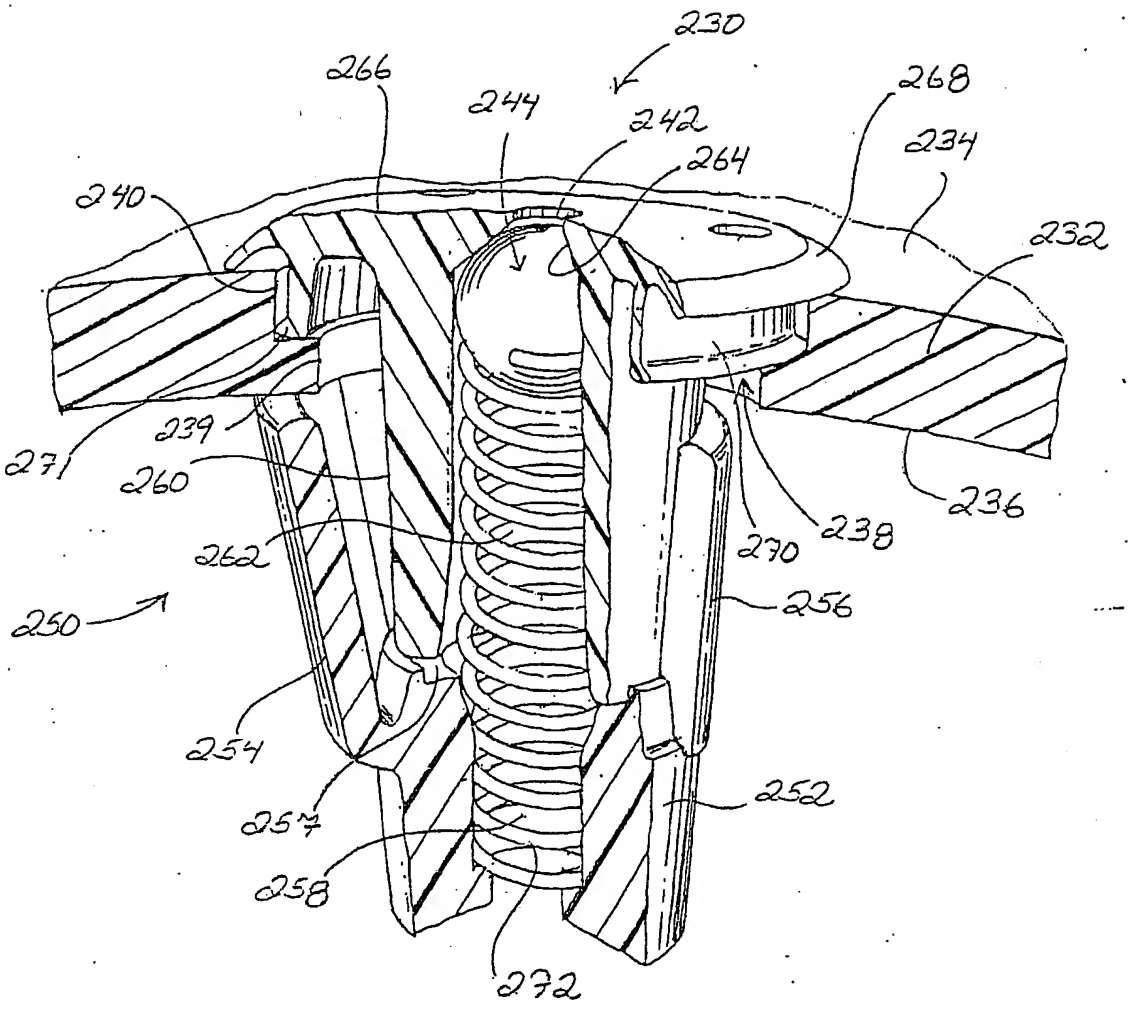
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Fig. 18

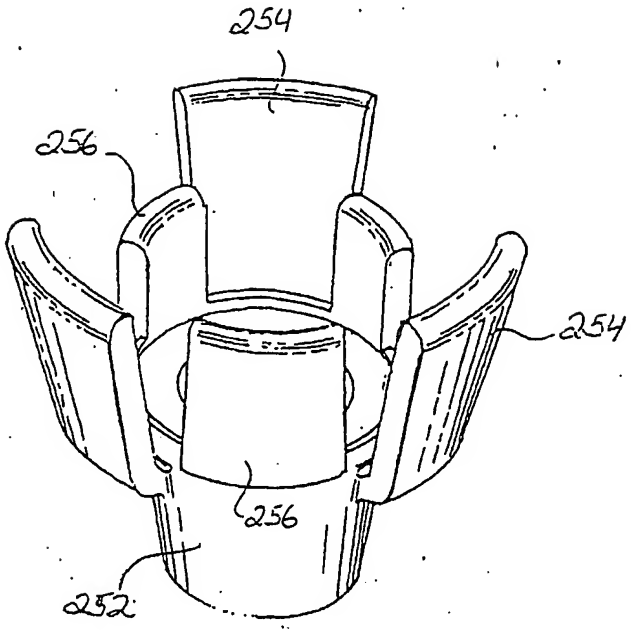

Fig. 19

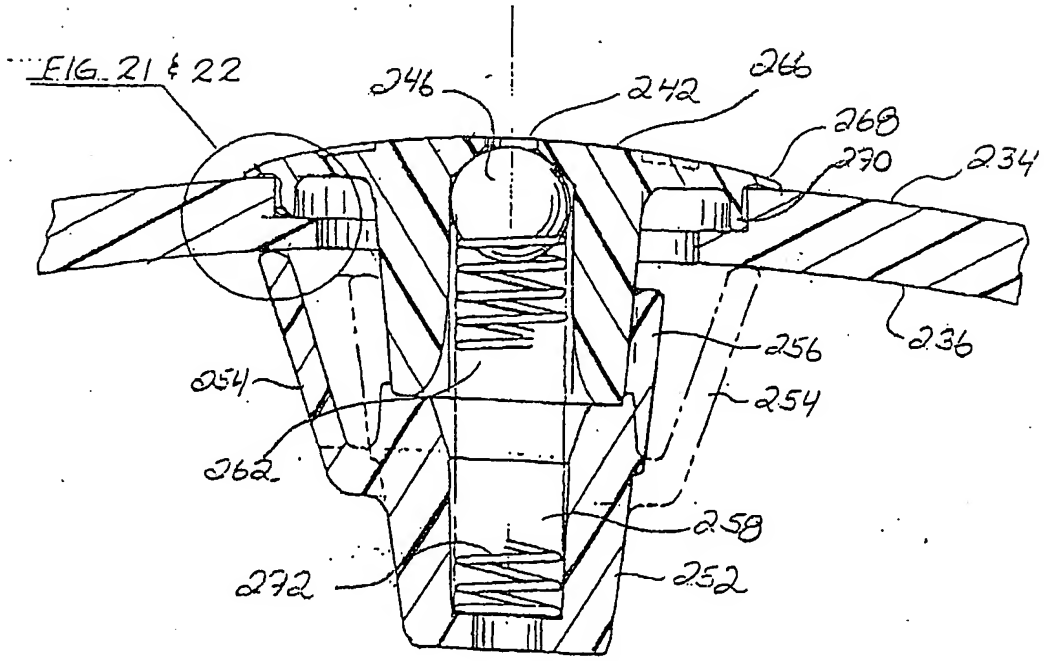

Fig. 20B

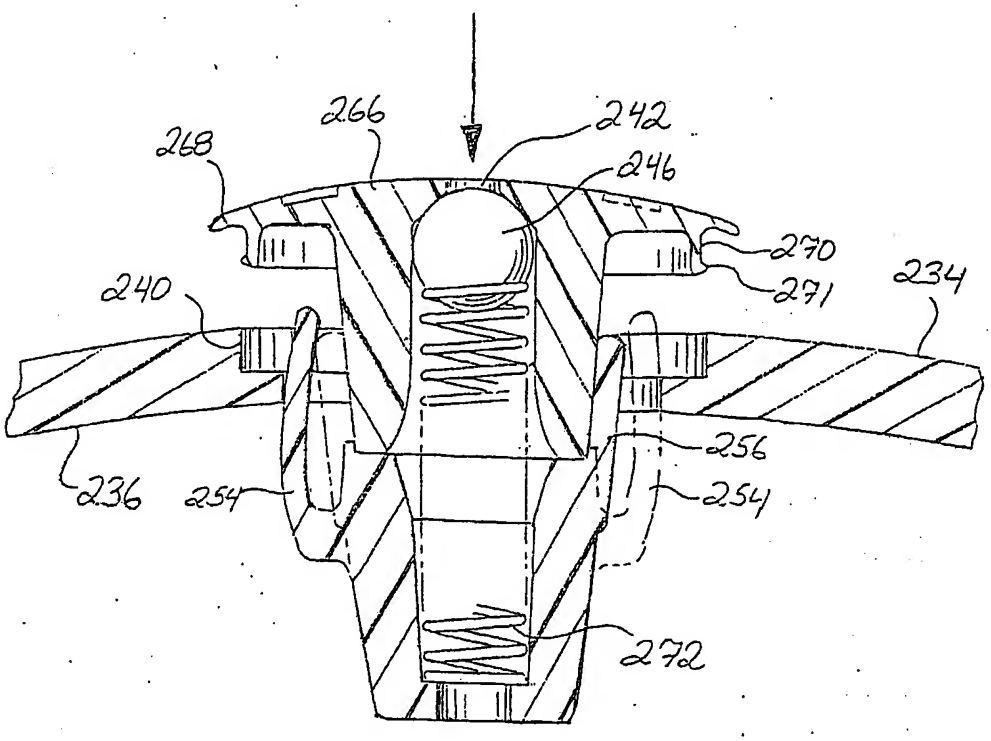

Fig. 20A

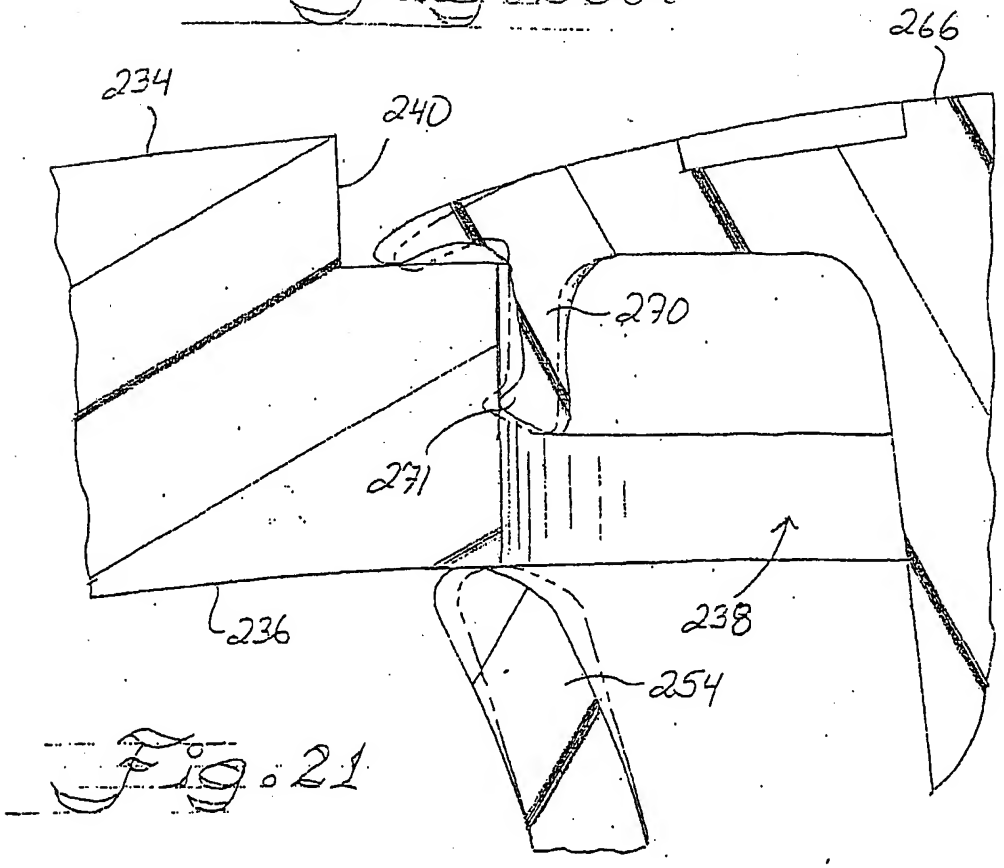

Fig. 21

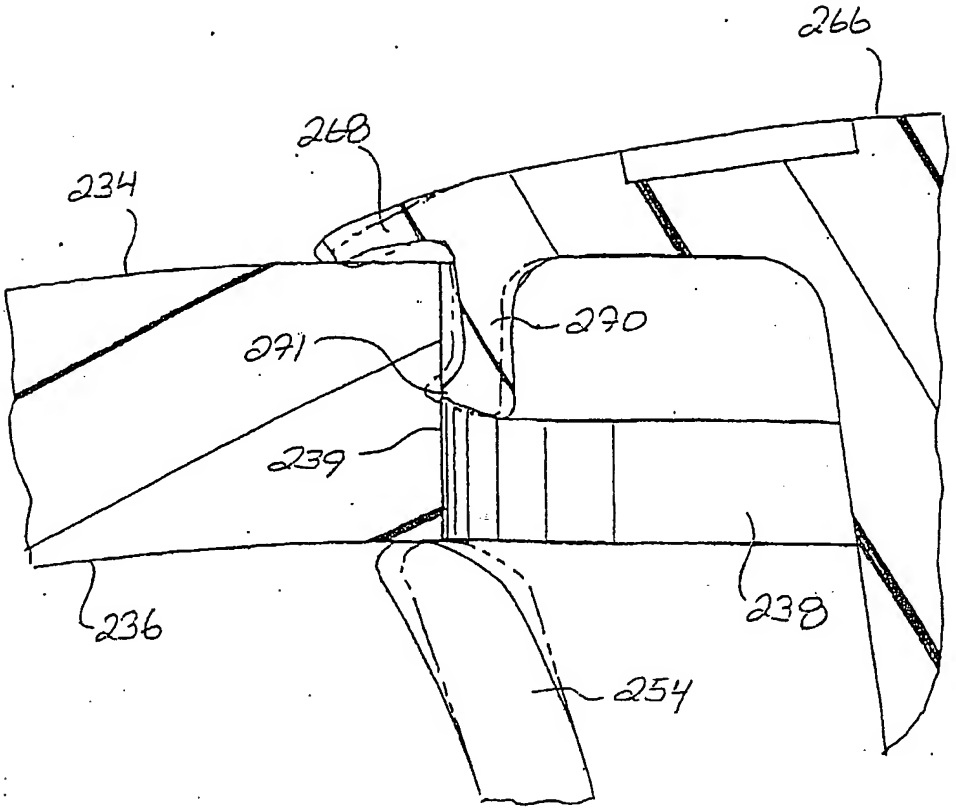
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Fig. 22

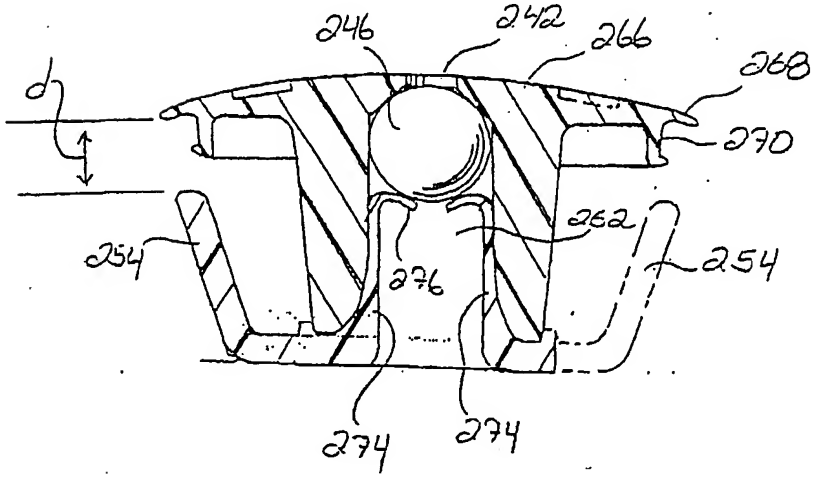
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Fig. 23

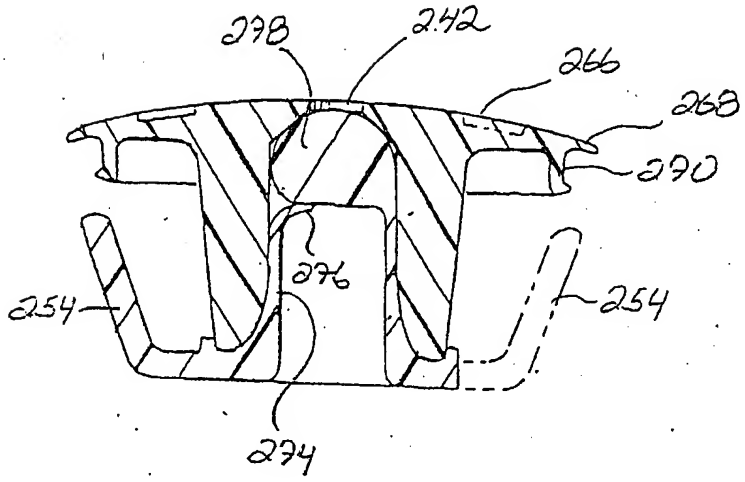

Fig. 24

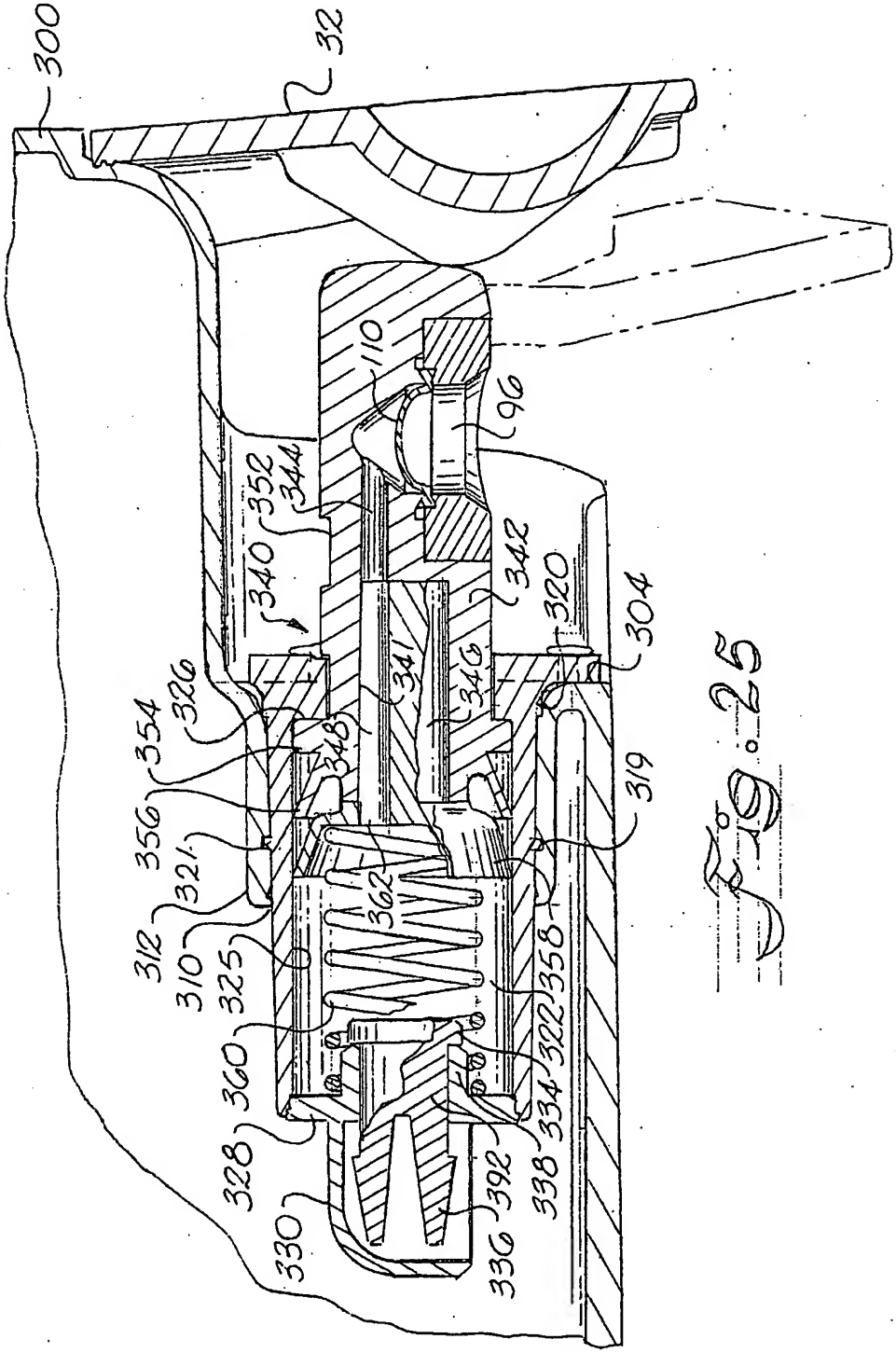
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Fig. 25

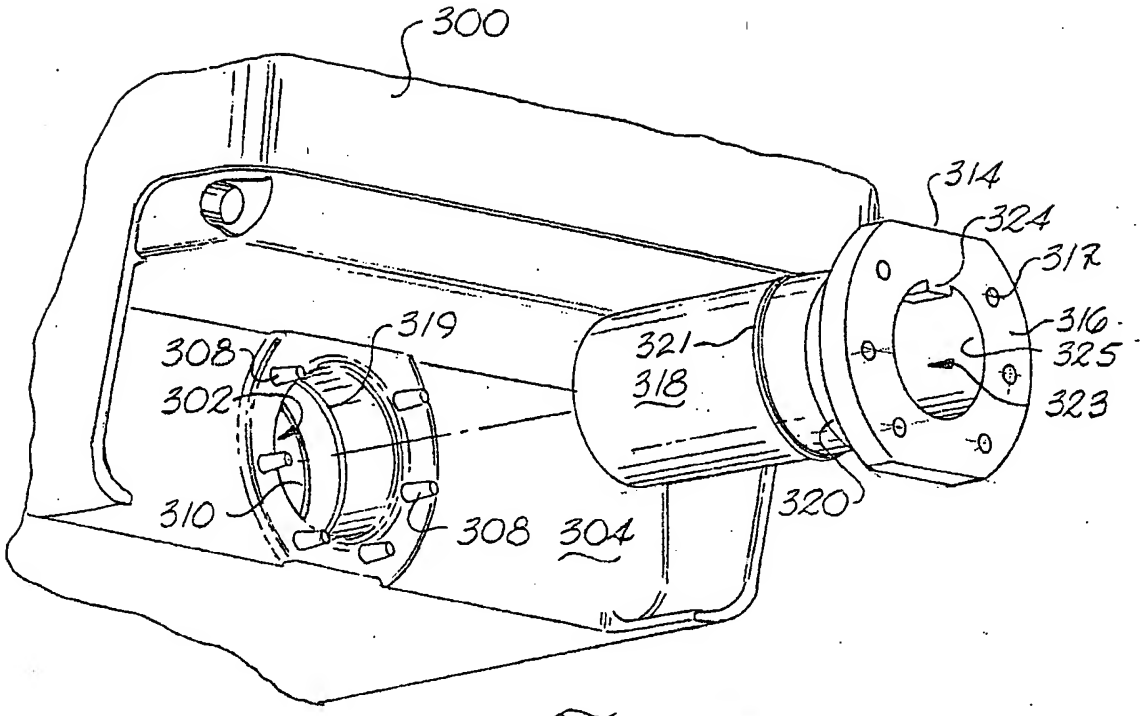
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Fig. 26

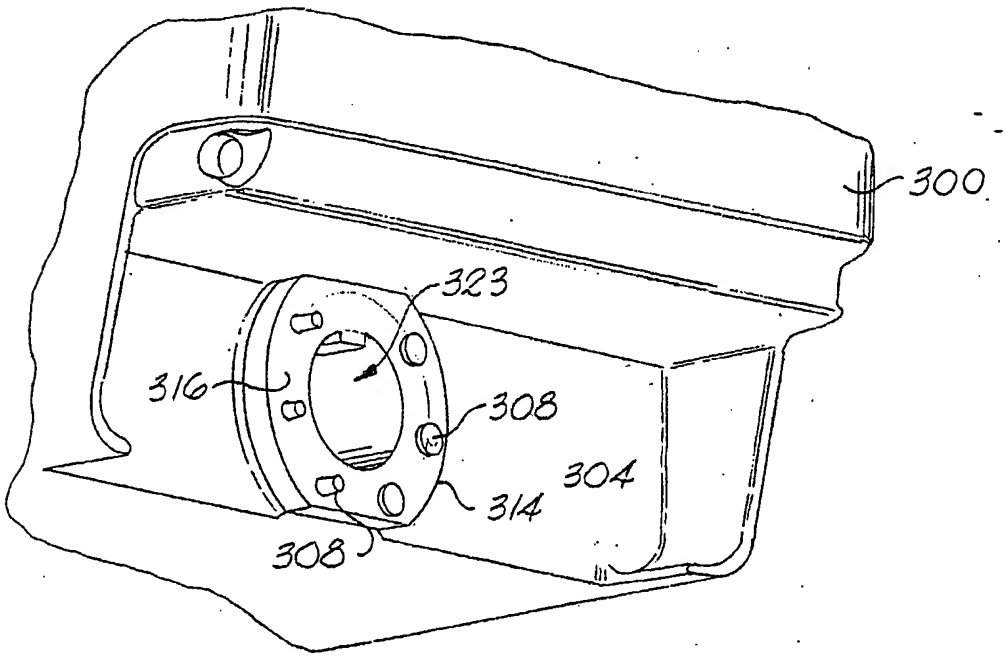
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Fig. 27

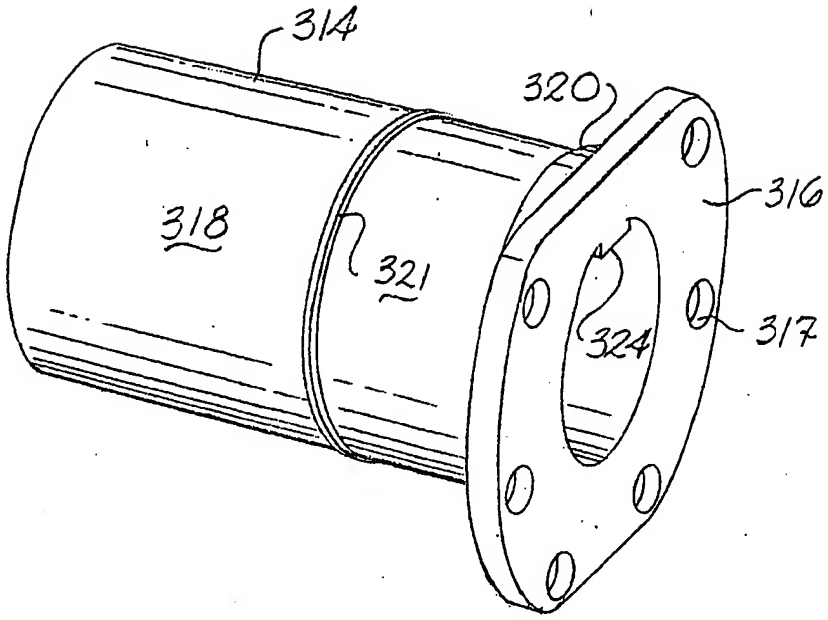

Fig. 28

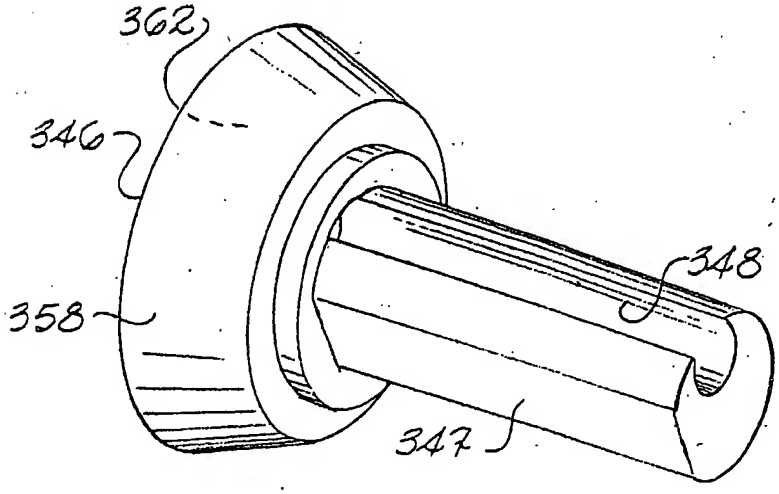

Fig. 29

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 01/44905

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A47K5/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A47K B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	NL 9 201 928 A (NOVEM TRADING INT BV) 1 June 1994 (1994-06-01)	1-6, 8-10,16, 17, 25-30, 46,47, 55-58, 60,62,65
A	the whole document	32,42

X	DE 22 54 386 A (SEPPIC SA) 17 May 1973 (1973-05-17)	1-3, 16-18, 23-25, 42-47,66
A	the whole document	4-11,21, 27-32

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
10 April 2002	17 04 2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Delzor, F

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 4 650 095 A (TELLA SHERWOOD T ET AL) 17 March 1987 (1987-03-17) the whole document	1,2, 16-18, 23-25,46 66 32,33, 42,55,76
X	US 4 166 553 A (FRATERRIGO SALVATORE G) 4 September 1979 (1979-09-04) the whole document	1-3, 12-14, 17,23,24
Y	EP 0 659 380 A (STEINER CO INC) 28 June 1995 (1995-06-28) figures 7,8	66
A	US 3 533 526 A (ADELL ROBERT) 13 October 1970 (1970-10-13) figure 2	6,7,10, 11, 30-32, 60,61

INTERNATIONAL SEARCH REPORT

ırmation on patent family members

Inte nal Application No
PCT/US 01/44905

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
NL 9201928	A	01-06-1994	NONE		
DE 2254386	A	17-05-1973	FR	2159793 A5	22-06-1973
			FR	2198559 A5	29-03-1974
			BE	790752 A1	15-02-1973
			DE	2254386 A1	17-05-1973
			IT	975463 B	20-07-1974
			LU	66448 A1	01-02-1973
			NL	7215275 A	15-05-1973
			JP	49058963 A	07-06-1974
US 4650095	A	17-03-1987	CA	1278278 A1	27-12-1990
US 4166553	A	04-09-1979	IT	1072495 B	10-04-1985
			CH	617900 A5	30-06-1980
			DE	7723786 U1	17-11-1977
			FR	2385609 A1	27-10-1978
EP 0659380	A	28-06-1995	US	5439144 A	08-08-1995
			CA	2136878 A1	28-06-1995
			EP	0659380 A1	28-06-1995
			JP	7204117 A	08-08-1995
US 3533526	A	13-10-1970	NONE		